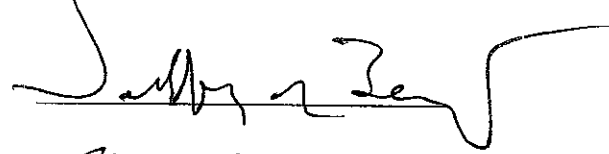


**FINAL
PRELIMINARY ASSESSMENT FOR
THE MUNITIONS RESPONSE PROGRAM,
NAVAL WEAPONS STATION SEAL BEACH
DETACHMENT FALLBROOK, CALIFORNIA**

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Malcolm Pirnie, Inc., prepared this report at the direction of Engineering Field Activity Northeast. This document should be used only with the approval of the Engineering Field Activity, Northeast. This report is based, in part, on information provided in other documents, and is subject to the limitations and qualifications presented in the referenced documents.

June 2006

EXECUTIVE SUMMARY

The Department of Defense (DoD) has established the Military Munitions Response Program (MMRP) under the Defense Environmental Restoration Program (DERP) to address munitions and explosives of concern (MEC) (including unexploded ordnance and discarded military munitions) and munitions constituents (MC) at other than operational military ranges and other sites. Closed, transferred, and transferring military ranges and sites not located on an operational range are considered other than operational. Although other than operational can include Formerly Used Defense Sites (FUDS) and Base Realignment and Closure (BRAC) ranges and sites, this report addresses other than operational ranges and sites at an active installation. It may include transferred ranges and munitions disposal sites associated with an active installation if they are not included in BRAC or FUDS programs.

This report represents a Preliminary Assessment (PA) for the Naval Weapons Station (NAVWPNSTA) Seal Beach Detachment Fallbrook (Detachment Fallbrook), California. Detachment Fallbrook occupies 8,852 acres about 53 miles north of San Diego in northern San Diego County, CA. It is 5 to 8 miles inland from the Pacific Coast, immediately adjacent to the eastern border of Marine Corps Base (MCB) Camp Pendleton, and south of the Santa Margarita River. Specifically, this PA covers the following 11 munitions response program (MRP) ranges/sites at Detachment Fallbrook: the Security Forces (SF) Small Arms Range, the Quality Evaluation (QE) Test Area, the Salvage Yard Landfill, the Dunnage Disposal Site #1, the Dunnage Disposal Site #2, the Dunnage Disposal Site #3, the Dunnage Disposal Site #4, the Dunnage Disposal Site #5, the Skeet/Trap Range, Depot Lake, and Lower Lake.

The DoD, the United States Navy (Navy), and the United States Environmental Protection Agency (USEPA) guidance for conducting and documenting PAs was followed and tailored, where appropriate, to address the unique aspects of MEC and MC. The PA provides the necessary information for Navy and regulatory decision-makers: 1) to eliminate from further consideration those MEC sites that pose minimal or no threat to public health or the environment; 2) to differentiate MEC sites that may not require further munitions response actions from those that will require further investigation and/or munitions response actions; 3) to determine if an imminent explosives safety hazard from MEC is present that warrants an accelerated response

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action; and 4) to determine if an imminent hazard from MC to human health and the environment warranting an accelerated response action exists.

The following recommendations for MEC and MC are made for the 11 ranges/sites located at Detachment Fallbrook. If additional data are discovered, the recommendations should be reviewed and updated appropriately.

SF Small Arms Range

The 0.4-acre SF Small Arms Range is located northeast of Building 366, in the eastern center of Detachment Fallbrook. The SF Small Arms Range was used from 1945 to 1991 by both the Marine Security Forces (from 1945 to 1988) and the civilian Security Forces (from 1987 to 1991) for handgun marksmanship training. The area is not currently in use. Munitions used at the range included .38-caliber, .45-caliber, and 9-millimeter (mm) rounds. Because the range was used for small arms, the range is not suspected to contain MEC and no evidence of MEC was found during the site visit. The potential for MC, specifically lead, exists at the site. Based on the data collected and presented in this PA, no further action (NFA) for MEC is recommended at the SF Small Arms Range. A Site Inspection (SI) is recommended at the SF Small Arms Range with respect to MC.

QE Test Area

The 60-acre QE Test Area (Installation Restoration Program (IRP) Site 26) is located in the southeast corner of Detachment Fallbrook, about one mile from the southern installation border. The QE Test Area was used as a burn and disposal area beginning in 1942, and included a powder disposal area, two small round metal burn barrels, a drop test tower, and at least three burn/slit trenches (not all features are currently present at the site). QE laboratory personnel used the QE Test Area as a munitions testing area from 1977 to 1989. The types of munitions tested included rifle grenades (both live and smoke), 3.5-inch rockets, 75-mm projectiles, and 60- and 81-mm mortars. The majority of the ordnance was picked up or destroyed by explosive ordnance disposal (EOD) personnel after each test. The area is not currently in use. The following munitions were observed during the site visit: 40-mm cartridges fired from grenade launchers, impulse cartridges, and pyrotechnic items such as flares. Blasting caps, igniters, and small arms ammunition were observed in the two small round metal burn barrels. Based on the data collected and presented in this PA, an SI is recommended for both MEC and MC at the QE Test Area.

Salvage Yard Landfill

The Salvage Yard Landfill (IRP Site 33) covers approximately 13 acres in the northeast corner of the installation, approximately 900 feet from the western corner of the installation. The Salvage Yard Landfill was a burial area for munitions and dunnage, according to personnel interviews, historical records, and recent visual surveys. Historical records indicate that expended cartridges, primers, live projectiles, and inert anti-tank projectiles were buried in the area. The area is not currently in use. The following MEC were observed during the visual surveys: a 25-pound bomb, a 3-pound pyrotechnic bomb, a 2 36-inch anti-tank high explosive (HE) rocket, 20-mm rounds, other projectiles, and other munitions scrap. Based on the data collected and presented in this PA, an SI is recommended for both MEC and MC at the Salvage Yard Landfill.

Dunnage Disposal Site #1

The 3 3-acre Dunnage Disposal Site #1 (IRP Site 34a) is located in the north-central portion of the Detachment Fallbrook. The site is L-shaped, extending north and east along two intermittent stream beds. The Dunnage Disposal Site #1 is considered a possible munitions burial site. The site was in use from 1942 to 1978 as a disposal area for dunnage. The area is not currently in use. A limited visual survey of the area revealed various inert rocket motors, practice 2000-pound bombs, a HE 20-mm projectile, several igniters, and other munitions scrap at the site. The site is known to contain MEC and suspected to contain MC. Based on the data collected and presented in this PA, an SI is recommended for both MEC and MC at the Dunnage Disposal Site #1.

Dunnage Disposal Site #2

The Dunnage Disposal Site #2 (IRP Site 34b) covers approximately 9 acres in the north central portion of the installation and is west of Walleye Road. The Dunnage Disposal Site #2 was in use from 1942 to 1978 as a disposal area for dunnage. The area is not currently in use. Investigation of the site and the installation records, and follow-up interviews, indicate that the Dunnage Disposal Site #2 was not used for munitions burial. Based on the data collected and presented in this PA, NFA for MEC and MC is recommended at the Dunnage Disposal Site #2. Any further investigations at the site will be under the IRP.

Dunnage Disposal Site #3

The 1.5-acre Dunnage Disposal Site #3 (IRP Site 34c) is located south of Terriea Road in the central portion of Detachment Fallbrook. The Dunnage Disposal Site #3 is a possible munitions

burial and disposal site. The area was used from 1942 to 1978 as a disposal area for dunnage. The area is not currently in use. According to personnel interviews, the site may have been used as a disposal and burial area for ordnance during this time. Inert rifle grenades and other munitions scrap were observed on the ground surface and in a wash area during the site visits. One H.E. 60-mm mortar was observed on the surface of the site. There is a possibility that other live ordnance was buried there, but this cannot be verified until an EOD technician checks each item buried at the site. Based on the data collected and presented in this PA, an SI is recommended for both MEC and MC at the Dunnage Disposal Site #3.

Dunnage Disposal Site #4

The Dunnage Disposal Site #4 (IRP Site 34d) covers approximately 1.8 acres west of Building 388 in the central portion of Detachment Fallbrook. The Dunnage Disposal Site #4 (IRP Site 34d) was used from 1942 to 1978 as a disposal area for dunnage. The area is not currently in use. Investigation of the site and the installation records, and follow-up interviews, indicate that the Dunnage Disposal Site #4 was not an ordnance burial site. Based on the data collected and presented in this PA, NFA for MEC and MC is recommended at the Dunnage Disposal Site #4. Any further investigations at the site will be under the IRP.

Dunnage Disposal Site #5

The 0.7-acre Dunnage Disposal Site #5 (IRP Site 34e) is in the southwest corner of Detachment Fallbrook. The Dunnage Disposal Site #5 was used from 1942 to 1978 as a disposal area for dunnage. The area is not currently in use. Investigation of the site and the installation records, and follow-up interviews, indicate that the Dunnage Disposal Site #5 was not used for munitions burial. Based on the data collected and presented in this PA, NFA for MEC and MC is recommended at the Dunnage Disposal Site #5. Any further investigations at the site will be under the IRP.

Skeet/Trap Range

The 31-acre Skeet/Trap Range is located in the central plateau of Detachment Fallbrook, near the eastern border. The site is bordered to the east by the SF Small Arms Range. The Skeet/Trap Range was a recreational skeet/trap range that was used by the Marine Security Forces and other station personnel after work hours from 1950 to 1987. The area is not currently in use. Munitions use at the range was limited to 12-gauge shotgun ammunition according to interviewees. Because the range was used for small arms, the range is not suspected to contain

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MEC and no evidence of MEC was found during the site visit. The potential for MC exists at the site, specifically lead and polycyclic aromatic hydrocarbons (PAHs). Based on the data collected and presented in this PA, NFA for MEC is recommended at the Skeet/Trap Range. An SI is recommended at the Skeet/Trap Range with respect to MC.

Depot Lake and Lower Lake

9
unexpended
The 12-acre Depot Lake is on the western part of the installation, just north of Terriea Road and between buildings 763 and 736. The 3-acre Lower Lake is on the southwestern corner of the installation, approximately 300 feet north of Shaik Road and just west of the Group 13 magazines. Both artificial lakes were identified as disposal sites for munitions in a 1958 memorandum, which states that the lakes were used for disposal of 20-mm, 40-mm, and 60-mm cartridges and 7 2-inch projector charges during World War II (WWII). The memorandum also states that other munitions may have been dumped in the lakes and that munitions had been recovered from the lakes in the past during dry summer seasons. It also requests that EOD technicians perform diving operations at the lakes to salvage MEC. No records were found to indicate whether diving operations took place or whether additional munitions were found in the lakes. Personnel interviewed in September 2004 stated that the Marine Security Forces may have dumped unexpended shells into the lakes instead of returning them to the Navy inventory. Currently, the lakes are used to store water on the installation, for fish and wildlife enhancement, and for wildfire protection. The lakes have also been used in the past for recreational boating and fishing (strict catch and release policy). As of 2004, all recreational activities were discontinued at Depot and Lower Lakes. Based on the data collected and presented in this PA, a site inspection (SI) is recommended for MEC and MC at both Depot Lake and Lower Lake.

More detailed summaries and recommendations for the 11 ranges/sites located at Detachment Fallbrook are given in Section 5.0.

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ACRONYMS

BRAC	Base Realignment and Closure
CD	compact disc
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSM	conceptual site model
CWM	chemical warfare material
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DU	depleted uranium
EFANE	Engineering Field Activity, Northeast
EOD	explosive ordnance disposal
ESQD	Explosive Safety Quantity Distance
°F	degrees Fahrenheit
ft	foot/feet
FUDS	formerly used defense site
FY	fiscal year
HE	high explosive
HMX	high melting explosive
INRMP	Integrated Natural Resources Management Plan
IRP	Installation Restoration Program
LANTDIV	Atlantic Division
LCDR	Lieutenant Commander
MEC	munitions and explosives of concern
MC	munitions constituents
MCB	Marine Corps Base
MCPD	Marine Corps Program Division
mm	millimeter
MMRP	Military Munitions Response Program
MRP	Munitions Response Program
MSL	mean sea level
NAD	Naval Ammunition Depot

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NAND	Naval Ammunition and Net Depot
NAVFAC	Naval Facilities Engineering Command
NAVWPNSTA	Naval Weapons Station
NFA	No Further Action
NCP	National Contingency Plan
OE	Ordnance and Explosives
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbons
PBX	plastic-based explosives
PETN	Pentaerythritol tetranitrate
POC	point of contact
QE	Quality Evaluation
RG	record groups
RDX	royal demolition explosive
RPM	remedial project manager
SARA	Superfund Amendment and Reauthorization Act
SDZ	Surface Danger Zone
SF	Security Forces
SI	Site Inspection
SWRCB	State Water Resources Control Board
TNT	2,4,6-trinitrotoluene
U.S.	United States
U.S.C	United States Code
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordnance
VERTREP	vertical replenishment
WWII	World War II

GLOSSARY OF TERMS

Base Realignment and Closure (BRAC) – A Department of Defense (DoD) program that focuses on compliance and cleanup efforts at military installations undergoing closure or re-alignment, as authorized by Congress in four rounds of base closures for 1988, 1991, 1993, and 1995. (DERP Management Guidance, September, 2001)

Closed Range – A range that has been taken out of service as a range and that either has been put to new uses that are incompatible with range activities or is not considered by the military to be a potential range area. A closed range is still under the control of a DoD component. (DERP Management Guidance, September, 2001)

Defense Site – All locations that are or were owned by, leased to, or otherwise possessed or used by the DoD. The term does not include any operational range, operating storage or manufacturing facility, or facility that is used or was permitted for the treatment or disposal of military munitions. (10 United States Code (U.S.C.) 2710(e)(1))

Discarded Military Munitions – Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations. (10 U.S.C. 2710(e)(2))

Explosive Ordnance Disposal (EOD) – The detection, identification, field evaluation, rendering-safe, recovery, and final disposal of unexploded ordnance (UXO). It may also include the rendering-safe and/or disposal of EO (explosive ordnance) which has become hazardous by damage or deterioration, when disposal of such EO requires techniques, procedures, or equipment which exceed the normal requirements for routine disposal. (OPNAVINST 8027.1G, 14 Feb 92)

Explosives Safety – A condition where operational capability and readiness, personnel, property, and the environment are protected from the unacceptable effects of an ammunition or explosives mishap. (DoD Directive 6055 9 July 1996)

Formerly Used Defense Site (FUDS) – Real property that was formerly owned by, leased by, possessed by, or otherwise under the jurisdiction of the Secretary of Defense or the Components (including governmental entities that are the legal predecessors of DoD or the Components) and those real properties where accountability rested with DoD but where activities at the property were conducted by contractors (i.e., government-owned, contractor-operated (GOCO) properties) that were transferred from DoD control prior to October 17, 1986. The status of a site as a FUDS is irrespective of current ownership or current responsibility within the federal government. (DERP Management Guidance, September, 2001)

Magazine – Any building or structure used exclusively for the storage of ammunition and explosives. (Department of Defense Ammunition and Explosive Safety Standard, October 5, 2004)

Munitions Constituents (MC) – Any materials originating from unexploded ordnance, discarded military munitions or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions. (10 U.S.C. 2710 (e)(3))

Munitions and Explosives of Concern (MEC) – This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks, means: unexploded ordnance, discarded military munitions or munitions constituents (e.g., TNT, RDX) present in high enough concentrations to pose an explosive hazard. (OUSD(AT&L) 18 December 2003)

Operational Range – A range that is under the jurisdiction, custody, or control of the Secretary of Defense and that is used for range activities, or although not currently being used for range activities, that is still considered by the Secretary to be a range and has not been put to a new use that is incompatible with range activities. (10 U.S.C. 101 (e)(3))

Other than Operational Range – Encompasses closed, transferred and transferring ranges.

Range – A designated land or water area set aside, managed, and used for range activities of the DoD. Ranges include firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, electronic scoring sites, buffer zones with restricted access and exclusionary areas, and airspace areas designated for military use in accordance with regulations.

and procedures prescribed by the Administrator of the Federal Aviation Administration (10 U.S.C. 101 (e)(3))

Transferred Range – A property formerly used as a military range that is no longer under military control and had been leased by the DoD, transferred, or returned from the DoD to another entity, including federal entities. This includes a range that is no longer under military control but was used under the terms of a withdrawal, executive order, special-use permit or authorization, right-of-way, public land order, or other instrument issued by the federal land manager (DERP Management Guidance, September, 2001)

Transferring Range – A range that is proposed to be transferred or returned from the DoD to another entity, including federal entities. This includes a range that is used under the terms of a withdrawal, executive order, act of Congress, special-use permit or authorization, right-of-way, public land order, or other instrument issued by the federal land manager or property owner. An operational or closed range will not be considered a “transferring range” until the transfer is imminent (DERP Management Guidance, September, 2001)

Unexploded Ordnance – Military munitions that have been primed, fused, armed, or otherwise prepared for action; have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and remain unexploded either by malfunction, design, or any other cause. (10 U.S.C. 101(e)(5))

1. INTRODUCTION

The Department of Defense (DoD) has established the Military Munitions Response Program (MMRP) under the Defense Environmental Restoration Program (DERP) to address munitions and explosives of concern (MEC) [including unexploded ordnance and discarded military munitions] and munitions constituents (MC) at other than operational military ranges and other sites. The term "other than operational ranges" includes closed, transferred and transferring military ranges, as well as any other past-use site known or suspected to contain MEC or MC that is not located on an operational range. Although other than operational can include Formerly Used Defense Sites (FUDS) and Base Realignment and Closure (BRAC) ranges and sites, this report addresses other than operational ranges and sites at an active installation. It may include transferred ranges and munitions disposal sites associated with an active installation if they are not included in the BRAC or FUDS programs.

The DoD and the United States Navy (Navy) are currently establishing policy and guidance for munitions response actions under the Navy Munitions Response Program MRP. However, key program drivers developed to date conclude that munitions response actions will be conducted under the process outlined in the National Contingency Plan (NCP) (40 Code of Federal Regulations (CFR) 300) as authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 United States Code (U S C.) 9605, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), Pub L. 99-499 (hereinafter CERCLA). This report represents a Preliminary Assessment (PA) for 11 MRP ranges/sites at Naval Weapons Station (NAVWPNSTA) Seal Beach Detachment Fallbrook (Detachment Fallbrook), California. DoD, Navy, and United States Environmental Protection Agency (USEPA) guidance for conducting and documenting PAs were followed and tailored, where appropriate, to address the unique aspects of MEC and MC.

This PA Report is organized into the following sections:

- Section 1 – Introduction
- Section 2 – Installation Background
- Section 3 – Physical and Environmental Characteristics
- Section 4 – Summary of Data Collection Effort
- Section 5 – Site Characteristics

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The following supporting information is appended to this PA:

- References (Appendix A)
- Project Source Data – General (Appendix B)
- Project Source Data – Site Specific (Appendix C)
- Ordnance Technical Data Sheets (Appendix D)
- Response to Comments (Appendix E)

Two interactive compact discs (CDs) are included with the final version of this report. The first CD will include electronic files of the report text, tables, figures, appendices, and project source data. The second CD will include interactive Geographical Information System (GIS) maps of the installation and ranges/sites.

1.1. Purpose

This PA summarizes the history of munitions use at the following former ranges/sites at Detachment Fallbrook: the Security Forces (SF) Small Arms Range, the Quality Evaluation (QE) Test Area, the Salvage Yard Landfill, the Dunnage Disposal Site #1, the Dunnage Disposal Site #2, the Dunnage Disposal Site #3, the Dunnage Disposal Site #4, the Dunnage Disposal Site #5, the Skeet/Trap Range, Depot Lake, and Lower Lake. The PA provides an assessment of the current conditions with respect to MEC and MC. The PA provides the necessary information for Navy and regulatory decision-makers: 1) to eliminate from further consideration those MEC sites that pose minimal or no threat to public health or the environment; 2) to differentiate MEC sites that may not require further munitions response actions from those that will require further investigation and/or munitions response actions; 3) to determine if an imminent explosives safety hazard from MEC is present that warrants an accelerated response action; and 4) to determine if an imminent hazard from MC to human health and the environment warranting an accelerated response action exists.

1.2. Programmatic Framework

The regulatory structure for managing Navy MRP sites is guided by a complex mixture of federal, state, and local laws, as well as DoD and Navy regulations and guidance, and provides the necessary information for Navy decision makers. The key legislation, policy, and guidance directing the program includes, but is not limited to, the following:

DERP Management Guidance (September 2001)

The DERP Management Guidance establishes a MRP element for MEC and MC defense sites. The history of DERP dates back to the SARA of 1986¹. The scope of the DERP is defined in 10 U.S.C. §2701(b), which states that the: “Goals of the program shall include the following: ... (1) The identification, investigation, research and development, and cleanup of contamination from hazardous substances, and pollutants and contaminants. (2) Correction of other environmental damage (such as detection and disposal of unexploded ordnance) which creates an imminent and substantial endangerment to the public health or welfare or to the environment ...”

Draft DoD Directive Military Munitions Response Policy on Other Than Operational Ranges

The Draft DoD Directive 4715 MRP (September 2003 version) states that munitions response will be conducted “in accordance with CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP)”

National Defense Authorization Act (FY02) (Sections 311-312)

Sections 311-312 of the National Defense Authorization Act of fiscal year (FY) 2002 reinforced the DoD’s 2001 DERP Management Guidance by tasking the DoD to develop and maintain an inventory of defense sites that are known or suspected to contain MEC and MC. Section 311 requires the DoD to develop a protocol for prioritizing defense sites for response activities in consultation with the states and Tribes. Section 312 requires the DoD to create a separate program element to ensure that the DoD can identify and track munitions response funding.

The September 2001 Management Guidance for the DERP and the Defense Authorization Act 2002, described above, established the MRP. The DoD provides program guidance and methods for conducting a baseline inventory of defense sites containing, or potentially containing, MEC and/or MC. The Navy baseline inventory of sites was completed in FY 2002 and was used to establish the sites where PAs are needed to further evaluate the potential for MEC and MC.

¹ SARA was signed into law on October 17, 1986, and amended the CERCLA of 1980, 42 U.S.C. §9601 et seq. Related sections in Title 10 of the U.S.C. (10 U.S.C. §§2702-2710 and §§2810-2811) further define the program.

1.3. Project Management

This PA has been coordinated and managed by the Navy Engineering Field Activity Northeast (EFANE), a component of Naval Facilities Engineering Command (NAVFAC). The EFANE performs engineering functions for Navy installations throughout the northeast U.S. and is the Program Manager for this PA. Malcolm Pirnie, Inc. has been contracted to prepare this PA. The Southwest Division of NAVFAC provides technical guidance and management for environmental projects at Detachment Fallbrook. The Navy Remedial Project Manager (RPM) and the installation point of contact (POC) for Detachment Fallbrook provided valuable information and assistance throughout the PA data collection process.

1.4. Preliminary Assessment Approach

The CERCLA implementing guidance, which was prepared for sites contaminated with hazardous substances, describes the PA as a limited-scope investigation based upon existing and available data. However, the guidance also states that the PA process developed under CERCLA is not equally applicable to all sites and all contaminants and that variation from the guidance may be necessary. Sites containing MEC are prime examples of sites where the generic CERCLA process is incomplete. Unique explosives safety issues associated with MEC cannot be assessed solely with the parameters developed for chemical and hazardous waste contaminants. Therefore, while this PA generally follows CERCLA guidance, certain elements of the report have been tailored to address the unique explosives safety aspects of MEC.

The PA process for each of the sites involved collecting and reviewing existing and available information about the site, including off-site and on-site research and interviews. It also included a visual survey to assess physical evidence that might indicate the presence of MEC (e.g., discarded munitions items, ordnance penetration holes, and scarred trees) and MC (e.g., ground scarring, stressed vegetation, chemical residue) at the site. The Malcolm Pirnie data collection team conducted two site visits for data collection and visual surveys. The first was from 27 through 30 September 2004 and the second was from 8 through 11 March 2005.

This PA includes and makes use of all available data relating to munitions use at Detachment Fallbrook, including historical records, aerial photographs, field data, anecdotal evidence, interviews with site personnel, and professional knowledge and experience. It is based, in part, on information provided in documents referenced in Appendix A and is subject to the limitations and qualifications presented in the referenced documents.

2. INSTALLATION BACKGROUND

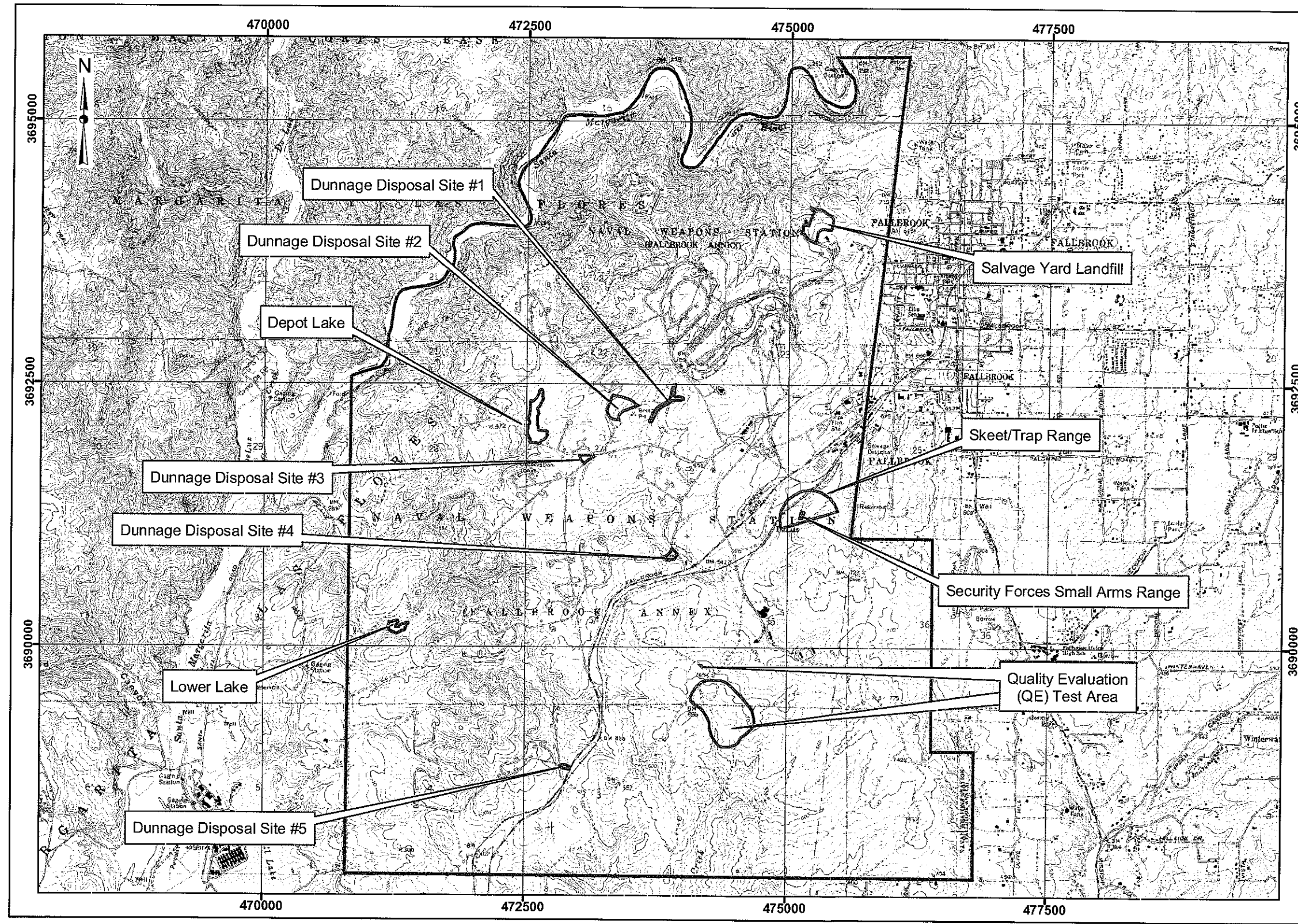
This section provides Detachment Fallbrook's location, history, and munitions-related training, storage, and usage.

2.1. Location and Setting

Detachment Fallbrook is 53 miles north of San Diego in northern San Diego County, CA. It is approximately 9 miles inland from the Pacific Coast immediately adjacent to the eastern border of Marine Corps Base (MCB) Camp Pendleton, and south of the Santa Margarita River. Other neighboring properties include the Santa Rosa Plateau, the Palomar Mountain Complex, and the San Mateo Wilderness Area of the Cleveland National Forest. The installation varies in elevation from 200 to 840 feet above mean sea level (MSL) and is characterized by mountains and alluvial bottomlands. The installation currently occupies 8,852 acres and is surrounded by a chainlink fence. Only about 274 acres are developed, the rest is mostly open space due to the Explosive Safety Quantity Distance (ESQD) Arcs around the magazines. The one housing complex at the installation is located in the northeast portion of the installation and is classified as all family housing with a total of nine housing units - five single family units and two duplex units. Both children and pets are allowed at the housing complex, and the housing complex is fully occupied as of the date of this report. The location of the installation and the associated MRP ranges/sites are provided on Map 2-1-1.

2.2. Installation History

Naval Ammunition Depot (NAD) Fallbrook was commissioned in February of 1942, after the U.S. Attorney General condemned 9,150 acres in San Diego, CA in order to establish a naval ammunition depot in the area. The acreage was taken from the Santa Margarita Ranch, which was originally a Spanish land-grant. The depot's mission was to receive, store, and guard large quantities of explosives and ammunition, and to distribute and deliver them as needed to other installations. The original facilities included 133 magazines, barracks, and administration and service buildings; 16 miles of railroad; and 115 miles of roads and trails.



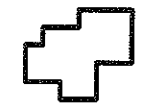
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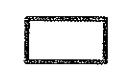
**MALCOLM
PIRNIE**

Map 2.1-1
Area Location Map

Legend



Installation Boundary



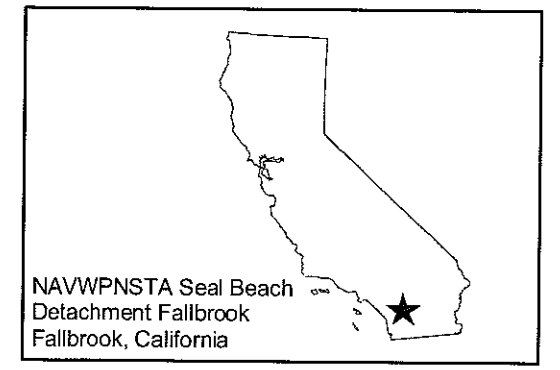
Potential MRP Sites

0 600 1,200 Meters

Data Source: NAWPNSTA Seal Beach GIS Data
USGS 7.5 minute topo maps

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006



In 1947, NAD Fallbrook was put on caretaker status and its staff was reduced. The Korean War (1950) brought an end to the caretaker status of the depot. In 1953, the Marine Barracks at the depot became a separate command, which replaced the Marine Guard detachment from MCB Camp Pendleton that had provided station security since 1942.

NAD Fallbrook was annexed to the Naval Ammunition and Net Depot (NAND) Seal Beach in 1958. During the 1960s, Fallbrook's primary duty was to support the Pacific Marine Forces. It also stored, tested, and maintained several types of missiles (e.g., Walleye, Shrike, and Sparrow). The installation's name was changed to NAVWPNSIA Seal Beach, Detachment Fallbrook in 1997, after ordnance handling installations were reorganized. Currently, Detachment Fallbrook is the Navy's primary West Coast ordnance storage, loading, and maintenance installation.

The only West Coast air-launched missile production facility is located at Detachment Fallbrook, where air-launched missiles such as the Phoenix, Sidewinder, Maverick, and high-speed anti-radiation missile are inspected, maintained, and re-certified. The last remnants of the nation's napalm stockpile were stored at Fallbrook, and a state-of-the-art facility was built on base to help eliminate these weapons. The last full napalm canister was destroyed in March, 2001.

Detachment Fallbrook is unique among naval weapons storage areas because it is located inland. Ammunition is transferred to and from ships by a process known as Vertical Replenishment, or VERTREP. In this operation, ammunition is taken by trucks from a magazine on base to a helicopter pad located on the coast inside MCB Camp Pendleton. From there, a helicopter picks up the load and transfers it to the receiving ship waiting several miles off the coast. In this manner, large vessels such as aircraft carriers and amphibious assault ships can be loaded without leaving their primary Southern California operating and training areas.

2.3. Munitions-Related Training / Storage / Usage

Detachment Fallbrook has been in operation since 1942 with a primary mission as a depot for the receipt, storage, and delivery of different types of explosives and munitions. Munitions-related sites are scattered throughout the installation, inside the ESQD Arcs. The installation has 190 magazines, and they store pyrotechnics, high explosives, fuzes and detonators, and small arms, among other weapons. There are no active ranges on the installation.

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The MRP identified 11 former ranges/sites at the installation, eight of which were identified as munitions sites through historical documents and interviews. These ranges/sites are: the SF Small Arms Range, the QE Test Area, the Salvage Yard Landfill, the Dunnage Disposal Site #1, the Dunnage Disposal Site #3, the Skeet/Trap Range, Depot Lake, and Lower Lake. Three sites were found to be non-munitions related. These sites are: the Dunnage Disposal Site #2, the Dunnage Disposal Site #4, and Dunnage Disposal Site #5. This PA addresses all 11 former ranges/sites. All are briefly summarized below. Map 2 1-1 depicts the location of all the ranges/sites on the installation.

SF Small Arms Range

The former SF Small Arms Range covers 0.4 acres in the eastern central portion of Detachment Fallbrook, northeast of Building 366. The SF Small Arms Range was oriented for firing to the southwest. The guns were fired at targets positioned in front of a natural soil berm. It was used from 1945 to 1991 by both the Marine Security Forces (from 1945 to 1988) and the civilian Security Forces (from 1987 to 1991) for handgun marksmanship training. It was also used by station civilians and local law enforcement officers. Munitions used at the range include 38-caliber, 45-caliber, and 9-millimeter (mm) rounds.

QE Test Area

The former QE Test Area covers 60 acres in the southeast corner of Detachment Fallbrook, about one mile from the southern installation border. The site was originally used as a burn and disposal area starting in 1942, and included a powder disposal area, two small round metal burn barrels, a drop test tower, and at least three burn/slit trenches. The drop test tower (Building 348) was used from the 1950s through the early 1980s to test bomblets from cluster bombs (such as Rockeyes) and other munitions. QE Laboratory personnel used the QE Test Area for munitions testing from 1977 to 1989. Parts of the QE Test Area were used as burn/disposal pits until 1985. Munitions tested at the QE Test Area include rifle grenades (both live and smoke), 3.5-inch rockets, 75-mm projectiles, and 60- and 81-mm mortars.

Salvage Yard Landfill

The Salvage Yard Landfill, which covers 13 acres, is in the northeast corner of Detachment Fallbrook, about 900 feet from the western corner of the installation's border. The site was used as a storage yard from the 1950s to the late 1960s. The site is believed to be a burial area for munitions and dunnage, according to interviews, historical records, and recent site surveys.

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Munitions possibly buried at the Salvage Yard Landfill include expended cartridges, primers, live projectiles, and inert anti-tank projectiles. An explosive ordnance disposal (EOD) report from February 2002 describes an incident in which EOD technicians from MCB Camp Pendleton were called to the site to handle some suspected 20-mm and 40-mm rounds that were found on the ground surface, as well as some blasting caps.

Dunnage Disposal Site #1

The 3.3-acre Dunnage Disposal Site #1 is in the north-central portion of Detachment Fallbrook. It was used from 1942 to 1978 to dispose of dunnage and ordnance.

Dunnage Disposal Site #2

The 9-acre Dunnage Disposal Site #2 is in the north-central portion of the installation and is west of Walleye Road. It was used from 1942 to 1978 to dispose of dunnage.

Dunnage Disposal Site #3

The 1.5-acre Dunnage Disposal Site #3 is just south of Terriea Road in the central portion of Detachment Fallbrook. It was used from 1942 to 1978 to dispose of dunnage, and possibly ordnance. A 1978 memorandum from Tom Curtis, a former Commanding Officer at Detachment Fallbrook, states that numerous cases of inert-rifle-propelled grenades were buried in the area.

Dunnage Disposal Site #4

The 1.8-acre Dunnage Disposal Site #4 is west of Building 388 in the central portion of Detachment Fallbrook. It was used from 1942 to 1978 to dispose of dunnage.

Dunnage Disposal Site #5

The 0.7-acre Dunnage Disposal Site #5 is in the southwest corner of Detachment Fallbrook. It was used from 1942 to 1978 to dispose of dunnage.

Skeet/Trap Range

The former 31-acre Skeet/Trap Range is adjacent to the northeastern border of the SF Small Arms Range. The range was used recreationally for skeet and trap by the Marine Security Forces and other installation personnel after work hours from 1950 to 1987. Munitions used at the range were limited to 12-gauge shotgun ammunition, according to Mr. Kenneth A. Kaptain, a member of the MCB Camp Pendleton Fire Department.

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Depot Lake

Depot Lake, which covers 12 acres, is in the western part of the installation, just north of Terriea Road and between buildings 763 and 736. A 1958 memorandum states that two lakes were used as a munitions disposal site for certain munitions (20- mm, 40-mm, and 60-mm cartridges and 7 2-inch projector charges) during World War II (WWII). According to Mr. Robbie Knight, Natural Resource Manager for the installation, Depot Lake is one of the lakes referred to in the memorandum. The memorandum also states that other munitions may have been dumped in the lake and that munitions had been recovered from the lake in the past during dry summer seasons. It also requests that EOD technicians perform diving operations at the lake to salvage MEC.

Lower Lake

Lower Lake, which covers 3 acres, is in the southwestern part of the installation, approximately 300 feet north of Shaik Road and just west of the Group 13 magazines. A 1958 memorandum states that two lakes were used as a munitions disposal site for certain munitions (20-mm, 40-mm, and 60-mm cartridges, and 7.2-inch projector charges) during WWII. According to Mr. Robbie Knight, Natural Resource Manager, Lower Lake is one of the lakes referred to in the memorandum. The memorandum also states that other munitions may have been dumped in the lake and that munitions had been recovered from the lake in the past during dry summer seasons. It also requests that EOD technicians perform diving operations at the lake to salvage MEC.

3. PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

This section provides general information about Detachment Fallbrook, including its climate, topography, geology, soil and vegetation types, hydrology, hydrogeology, cultural and natural resources, and endangered species

3.1. Climate

The climate at Detachment Fallbrook is typical of the prevailing coastal southern California Mediterranean climate and is characterized by mild winters, cool summers, and infrequent rainfall. The annual average temperature in the Detachment Fallbrook vicinity is 63 degrees Fahrenheit (°F). Summer temperatures range from 61 °F at night to 90 °F during the day. Winters tend to be moderate, with temperatures ranging from 33 °F at night to 67 °F during the day. Precipitation ranges from 13.7 to 17.1 inches per year. January is the wettest month and July is the driest, with a mean of 0.02 inches of precipitation. Summers at the installation are punctuated by the Santa Ana (offshore) winds.

3.2. Topography

Detachment Fallbrook is in the foothills of northern San Diego County at an average elevation of 500 feet above MSL, between the Santa Margarita and San Onofre mountain ranges. The topography on the installation varies from the gently rolling slopes of the southern area to the steeply rising hills of the northern area. The elevations at the installation range from 200 feet above MSL in the southwest corner to 840 feet above MSL in the northern central area. Numerous swales and small hills dot the installation. Along the northwest boundary of the installation, the Santa Margarita River has a steep-sided canyon leading down to the riverbed and its alluvial terrace.

3.3. Geology

Detachment Fallbrook is in the Peninsular Ranges geomorphic province, which is characterized by a series of northwest-trending ranges and valleys. This geomorphic province is dominated by the igneous and metamorphic rocks of the Peninsular Range batholith. The Peninsular Ranges region is underlain primarily by plutonic (e.g., granitic) rocks that formed from the cooling of magma deep within the earth's crust. These magmas were generated during subduction of an oceanic crustal plate that was converging on the North American Plate between 140 and 90 million years ago. Extensive masses of plutonic rocks accumulated at depth to form the Southern

California Batholith. Intense heat and pressure associated with these plutonic magmas and plate tectonic movements metamorphosed the ancient sedimentary rocks into which the plutons intruded. These metasediments are now preserved in the Peninsular Range region as marbles, slates, schists, quartzites, and gneisses. Younger marine sedimentary rocks are exposed along the region's western shore.

3.4. Soil Types

There are 33 soil types of eight different major series at Detachment Fallbrook. Of these, some are alluvial, some derived from granite rock, and others are weathered in place from decomposed granodiorite. Soils formed from rock weathered in place are mostly sandy, upland loams, which are soft and easily eroded.

3.5. Vegetation Types

Detachment Fallbrook is composed mainly of open space where plant communities, habitats, and federally threatened or endangered species are able to thrive due to the low-intensity land use requirement of the site. Detachment Fallbrook and its neighbors comprise the largest remaining open space and wildlife in coastal Southern California. Fourteen primary vegetation communities occur on the site and generally correspond to seven wildlife habitat types: coastal sage scrub, mixed chaparral, chamise chaparral, valley foothill riparian, annual grassland, fresh emergent wetlands, and eucalyptus. The following nine vegetation communities are described in the 2005 Draft Final Detachment Fallbrook Integrated Natural Resources Management Plan (INRMP):

Diegan coastal sage scrub covers over 52% of Detachment Fallbrook lands. Generally on south and west facing slopes, coastal sage scrub predominates where the sun has the greatest desiccating effect. Coastal sage scrub on Detachment Fallbrook is a mosaic of five main sub-types, where different shrub species dominate and shrub density can vary greatly. It provides habitat for many sensitive species, including the Least Bell's vireo and the Stephens' kangaroo rat, and is considered critical habitat for the federally threatened coastal California gnatcatcher. Any activity that could potentially impact this habitat on Detachment Fallbrook requires mitigation or consultation with the U.S. Fish and Wildlife Service (USFWS).

Three types of chaparral associations combine to make up approximately 3% of Detachment Fallbrook's lands. Because chaparral and many of its component species are widely distributed

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in California, there is no direct threat to it as a vegetation type. This vegetation community is generally fenced inside the installation.

The Santa Margarita River and an associated network of ephemeral streams support abundant riparian vegetation with five plant associations. Although it covers only approximately 6.4% of Detachment Fallbrook, riparian associations support a greater diversity of wildlife than does any other habitat. Sensitive species found in riparian areas on Detachment Fallbrook include the federally endangered arroyo toad, the Southwestern willow flycatcher, and the Least Bell's vireo. This vegetation community is generally fenced inside the installation.

Oak woodlands cover approximately 2.4% of Detachment Fallbrook and are generally on north-facing slopes and in shaded ravines. Although many sensitive species use oak woodlands, no federally listed threatened or endangered species are known to rely on this habitat, and oak woodland communities are decreasing in size throughout California.

Less than one percent of Detachment Fallbrook consists of groves of eucalyptus trees. Native to Australia, the numerous eucalyptus species can grow quickly, are adapted to frequent fires, and prohibit understory growth through allelopathic chemicals in the leaf litter. Once established, eucalyptus will exclude most other native plant species. Eucalyptus trees, however, do provide roosting, nesting, and perching sites for native raptors.

Over 25% of Detachment Fallbrook is grassland, the majority of which is comprised of nonnative annual species. Grasslands provide habitat for several sensitive species, including the federally endangered Stephens' kangaroo rat.

Wetlands, including freshwater marsh and vernal pools, provide many vital ecological functions and support a high diversity of resident and migratory wildlife species at Detachment Fallbrook. Wetlands, however, are among the most impacted habitats and are often subject to regulatory jurisdiction under Section 404 of the Clean Water Act or Sections 9 and 10 of the Rivers and Harbors Act.

While no federally or state listed plants have been confirmed on the base, an estimated 101 of the 378 plant species on Detachment Fallbrook are nonnative. Nonnative, invasive plant species, or noxious weeds, can pose a serious threat to many native habitats by competitively excluding

native species and dramatically altering ecosystem dynamics. In accordance with Executive Order 13112 and Navy policy, Detachment Fallbrook has produced a Noxious Weed Management Plan and targets numerous invasive weeds for control, including the exotic pepper tree and *Arundo donax*.

3.6. Hydrology

There are three major flowing surface water bodies within Detachment Fallbrook: the Santa Margarita River, Fallbrook Creek, and Pilgrim Creek (see Map 3.1-1). The Santa Margarita River is formed by the junction of Murrieta Creek and the Temecula River just west of I-15 in Temecula, and south of SR79. The Santa Margarita River flows into Temecula Gorge and crosses the San Diego County line just northeast of the town of Fallbrook. From there, the river flows through MCB Camp Pendleton and to the Pacific Ocean. The Santa Margarita River provides an important water supply by restoring groundwater aquifers used by local residents and the Marine Corps. Fallbrook Creek would naturally be an intermittent or ephemeral stream within the Santa Margarita watershed, but due to runoff from agricultural and urban irrigation, it is now a perennial stream. MCB Camp Pendleton uses water from the Santa Margarita River and from Fallbrook Creek as water sources for its artificial Lake O'Neill, which is used to supplement its water supply and for recreational purposes. Pilgrim Creek is located on the northeast end of Oceanside and its flow is augmented in the summer months by runoff from an upstream nursery's water supply. There are also two large artificial lakes on the installation: Depot Lake and Lower Lake. Depot Lake is fed by two tributaries from the north and east and is held by an earthen dam at the southern end. Water is released from the lake by a spillway running beneath Terriea Road to the south. The spillway releases the lake water into an intermittent stream that connects with the Santa Margarita River outside the installation boundaries. Depot Lake is approximately 4 to 10 feet deep in the summer months and 6 to 18 feet deep in the winter months. Lower Lake is fed by streams from the north, east, and west and held by an earthen dam at the western end. The dam releases the lake water into an intermittent stream that feeds Lake O'Neill on MCB Pendleton. Lower Lake is approximately 8 to 16 feet deep during the summer months and 12 to 25 feet during the winter months. More specific bathymetry for the lakes is unknown.

3.7. Hydrogeology, Watersheds, and Water Resources

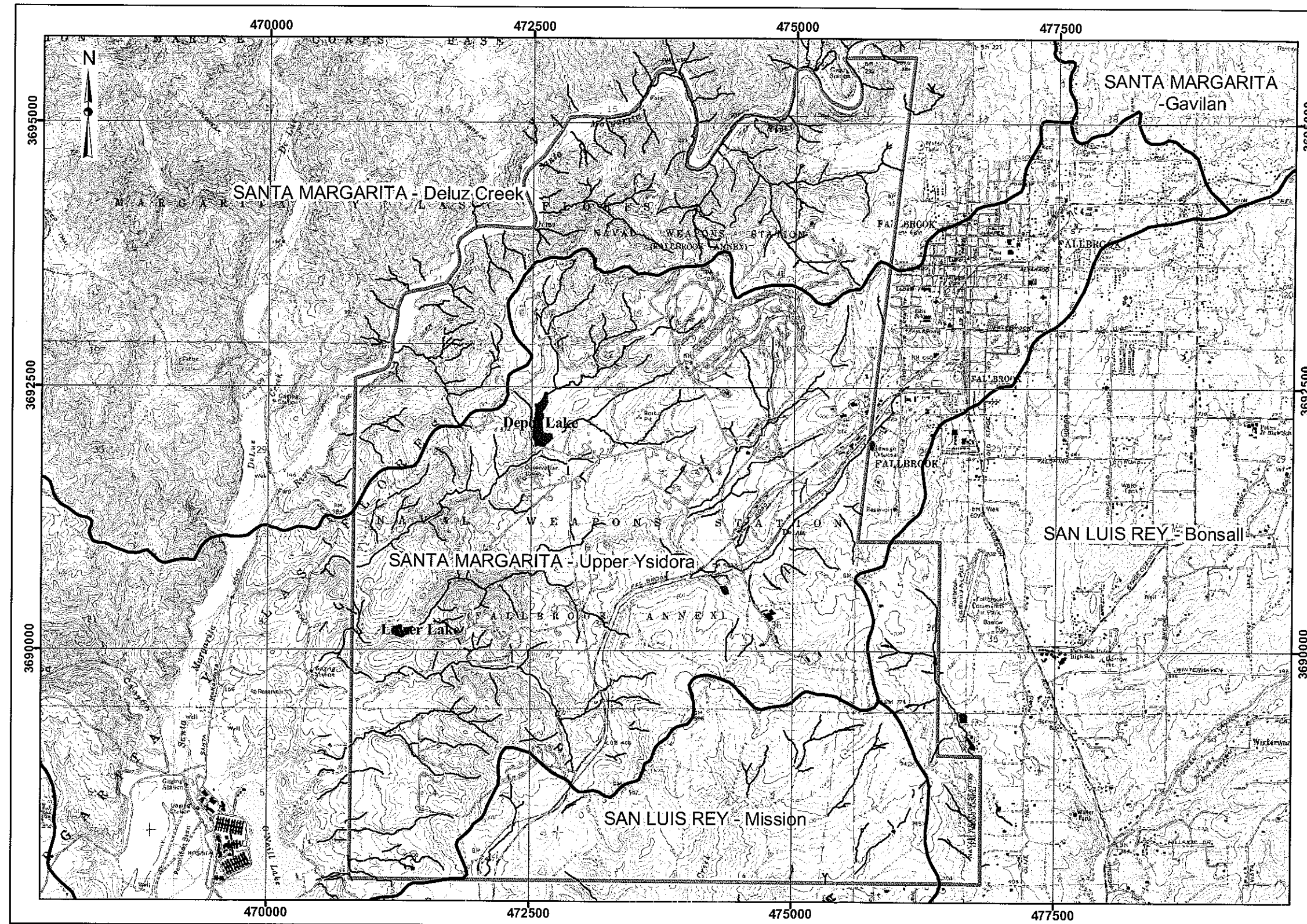
Detachment Fallbrook land is part of two coastal watersheds (see Map 3.1-1), the Santa Margarita River and the San Luis Rey River. The Santa Margarita River, which forms the northern border of the property, is the longest free flowing river in southern California and has a 750-square-mile

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watershed. Having largely escaped the development and channelization typical of the region, the Santa Margarita River and estuary support the largest populations of seven federal or state-listed endangered species. The San Luis Rey River watershed, which is represented by the Pilgrim Creek tributary on the Detachment Fallbrook, is 565 square miles and harbors 44 special status species.

Water resources management, including supply, use, conservation, and quality issues, is extremely important in southern California, where periodic drought and increasing urbanization are characteristic of the region. Detachment Fallbrook receives potable water, which is purchased from the San Diego County Water Authority, through Fallbrook Public Utility District water lines. Detachment Fallbrook also has a reclaimed water line running through the installation, which is anticipated for use as part of the irrigation system. MCB Camp Pendleton, located in the Santa Margarita River watershed, and the City of Oceanside, in the San Luis Rey River watershed, are located hydraulically down gradient from Detachment Fallbrook. Both extract and use groundwater as a potable water supply; the groundwater aquifers are recharged by percolation from overlying streams and rivers. Also, MCB Camp Pendleton uses water from the Santa Margarita River and from Fallbrook Creek as water sources for its artificial Lake O'Neill, which is used to supplement its water supply and for recreational purposes. At Lake O'Neill, no swimming is permitted. Fishing is permitted all year round. The fishing program includes a partial catch and release program based on posted signage.

Both surface and groundwater rights along the Santa Margarita River have been affected by a 1961 U.S. District Court decision (as part of the "Fallbrook Case"). Surface water rights are considered by the Court to be riparian rights for stockwater improvements. All stockponds on Detachment Fallbrook, with the exception of Depot Lake, are eligible for a certificate of validity of rights from the State Water Resources Control Board (SWRCB) as they were constructed prior to 1969 and are not more than 10 acre-feet in surface area. Depot Lake surpasses the size limit and, if possible, Detachment Fallbrook will need to obtain a State water right for use of the water through an application-permit-license procedure. Jurisdiction over groundwater was largely retained by the Court.







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**MALCOLM
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**Map 3.1-1
Area Surface Water
Bodies and Watersheds**

Legend

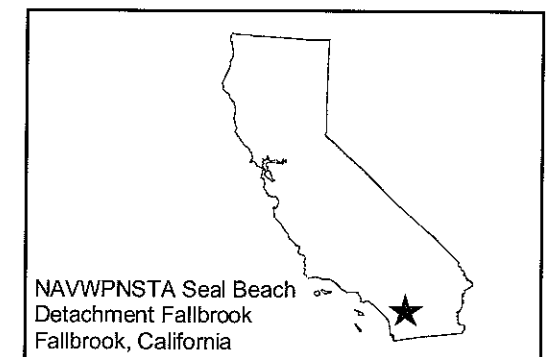
-  Installation Boundary
-  Watershed Boundary
-  Streams
-  Lakes

0 900 Meters

Data Source: NAWPNSTA Seal Beach GIS Data
USGS 7.5 minute topo maps

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

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The DoD enclave, which includes Detachment Fallbrook and MCB Camp Pendleton, must use historically granted water rights by 2006 or risk losing those rights to the SWRCB. The DoD enclave's rights would be claimed under Permit 15000, which was issued by the State of California in 1965.

The result of another court case regarding riparian water rights is that water districts in the upper Santa Margarita River watershed are required to discharge additional water into the river, and this water will be stored in a new reservoir on Detachment Fallbrook for groundwater recharge of the MCB Camp Pendleton aquifer. The water districts will have the right to purchase back the water from the DoD enclave for their own use. A conjunctive water use project is currently under consideration involving the reservoir that would address a number of ongoing concerns regarding water rights, water supply, and future water use between MCB Camp Pendleton and Fallbrook Public Utilities District.

Water quality at the Detachment Fallbrook falls under the jurisdiction of the San Diego Water Quality Control Board. Water quality monitoring at the site has indicated elevated fecal coliform counts, reduced dissolved oxygen levels, and high levels of sediment. Agricultural operations, septic systems, livestock, domestic animals, use of recycled water, and wastewater treatment facilities are all probable sources of pollution in the Santa Margarita River Watershed.

Groundwater data from wells in MCB Camp Pendleton indicate that the water levels there range from 80 to 100 feet above MSL. Detachment Fallbrook-specific information was obtained from an underground storage tank investigation completed at Buildings 230 and 232 on Ammunition Road. Three monitoring wells were installed at the site (MW-1, MW-2, and MW-3), the water levels ranged from 593 to 599 feet above MSL in 2003, and depth to water from ground surface in these wells was between 50 and 60 feet. The groundwater gradient implied by hydraulic head in the monitoring wells was towards the southwest.

3.8. Cultural and Natural Resources

Detachment Fallbrook has an archaeological heritage ranging from the pre-historic Paleo-Indian period to the Mexican-American War. The Final Cultural Resources Inventory and Survey Report for the Naval Weapons Station Seal Beach Detachment Fallbrook prepared in May 2000 by Mooney & Associates lists the cultural resources present at the installation. Approximately 4,900 acres of the installation have been surveyed for archeological purposes, and over 50

archeological sites were found. To preserve the integrity of the cultural resources, more specific information cannot be released to the public

3.9. Endangered, Threatened, and Species of Concern

Detachment Fallbrook, MCB Camp Pendleton, and the San Mateo Wilderness Area of the Cleveland National Forest comprise the largest remaining wildlife habitat area in coastal southern California, supporting approximately 500 species of plants and animals. Many species are residents and some are seasonal visitors, such as migratory birds. The California Wildlife and Habitat Analysis Branch website lists protected threatened and endangered species in San Diego County that may inhabit the installation or adjacent areas. These species are listed in Table 3.9-1. Species of concern that are found in San Diego County are listed in Table 3.9-2. Threatened and endangered species and associated critical habitats that are known or have been documented to be within or adjacent to the Detachment Fallbrook are listed and detailed in Table 3.9-3.

Table 3.9-1: Threatened and Endangered Species for San Diego County, California (2005)	
Ecological Receptors	Species
Federal Endangered Species	<ul style="list-style-type: none">• Least Bell's vireo (<i>Vireo bellii pusillus</i>) – has been a federal listed endangered species since 1986. It is a small, migratory songbird that eats primarily insects. Least Bell's vireos winter in southern Baja California, Mexico.• Arroyo toad (<i>Bufo californicus</i>) – has been a federal listed endangered species since 1995. It is a relatively small (2-3 inches) toad. The toad's color ranges from olive green or gray to light brown. Adult arroyo toads are primarily nocturnal, and prefer riparian habitats with sandy streambeds with cottonwood, sycamore, and willow trees.• Stephens' kangaroo rat (<i>Dipodomys stephensi</i>) – has been a federal listed endangered species since 1988. It has long hind legs, small front legs, and a white belly. It also has dark cinnamon brown fur and black and white tails. The kangaroo rat prefers to live in flat or gently rolling, often degraded, annual grassland. The Stephens' kangaroo rat eats seeds and is nocturnal.• Southwestern willow flycatcher (<i>Empidonax trillii extimus</i>) - has been a state listed endangered species since 1995. It is about 5.75 inches long and greenish or brownish gray with a white throat that contrasts with a pale olive breast. The belly is pale yellow. It breeds in dense riparian habitats along rivers, streams, or other wetlands.• Mountain yellow-legged frog (<i>Rana muscosa</i>) – has been

	<p>listed as a federal endangered species since 1999. It is moderately sized, about 1.5 to 3 inches. The body color is variable, usually a mix of brown and yellow, but often with gray, red, or green-brown. The throat is white or yellow, sometimes with mottling of dark pigment. The belly and undersurface of the high limbs range from pale lemon yellow to an intense sun yellow. It is diurnal, highly aquatic frogs, occupying rocky and shaded streams with cool waters originating from springs and snowmelt. It feeds on small, streamside arthropods. It does not occur in the smallest creeks.</p> <ul style="list-style-type: none">• Light-footed clapper rail (<i>Rallus longirostris levipes</i>) – has been listed as a federal endangered species since 1970. The light-footed clapper rail is a hen-sized marsh bird that is long-legged, long-toed, and approximately 14 inches long. It has a slightly down-curved beak and a short, upturned tail. Males and females are identical in plumage. Their cinnamon breast contrasts with the streaked plumage of its grayish brown back and gray and white barred flanks. It inhabits coastal salt and freshwater marshes containing cordgrass, cattails or tules, and rushes.• California least tern (<i>Sterna antillarum browni</i>) – has been listed as a federal endangered species since 1970. It has long, narrow wings and a broad, forked tail. The black-capped head and black-tipped, pale gray wings of the least tern contrast with its white body. It bears a white blaze across its forehead, dark forewings, black-tipped yellow bill, and yellowish feet. It is less than 9.84 inches when fully grown and has a 30-inch wingspan. Least terns are migratory, arriving in California in the spring of each year. They inhabit bays and lagoons and form breeding colonies in the adjacent open sandy beaches, dunes, or disturbed sites.• Southern steelhead (<i>Oncorhynchus mykiss irideus</i>) – has been listed as a federal endangered species since 1997. It is sea-run rainbow trout that has a large mouth with well-developed teeth on both upper and lower jaws, the head and shaft of the vomer, the palatines, and on the tongue. Southern steelheads have been reputed to attain a large size, up to 20 pounds or more.• Mohave tui chub (<i>Gila bicolor mohavensis</i>) – has been listed as a federal endangered species since 1970. It is a moderate- to large-sized subspecies of <i>Gila bicolor</i>. The male typically ranges from 2 to 4 inches, and rarely measure up to 7 inches. Female Mohave chubs are larger, and can reach up to 8.5 inches. Mohave tui chubs prefer lacustrine habitats, are always associated with deep pools and slough-like areas, and do poorly in fast-flowing streams that are more typical of headwater localities.
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- **Desert pupfish (*Cyprinodon macularius*)** – has been listed as a federal endangered species since 1986. It is a small, silvery-colored fish with 6 to 9 dark bands on its sides. This tiny fish grows to a full average length of only 2.5 inches. Its habitat includes warm desert pools, marshes, streams, and springs.
- **Unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*)** – has been listed as a federal endangered species since 1970. It is a small (less than 2.4 inches), scaleless fish that inhabits the slow and quiet waters of streams and rivers.
- **Tidewater goby (*Eucyclogobius newberryi*)** - has been listed as a federal endangered species since 1994. It is a small fish, rarely exceeding 2 inches in length, and is characterized by large pectoral fins and a ventral sucker-like disk formed by the complete fusion of the pelvic fins. The tidewater goby is a fish that occurs in estuaries and lagoons throughout coastal California.
- **Pacific pocket mouse (*Perognathus longimembris pacificus*)** – has been listed as a federal endangered species since 1994. It is a small brownish rodent. Pocket mice are only found within 4 kilometers of the coast on fine-grained sandy substrates in coastal sage scrub, coastal strand, and alluvium.
- **Peninsular bighorn sheep (*Ovis Canadensis nelsoni dps*)** – has been listed as a federal endangered species since 1998. It is compact and muscular; the muzzle, narrow and pointed; the ears, short and pointed; the tail, very short. The fur is deerlike and usually brown with whitish rump patches. Peninsular bighorn sheep live on dry, rocky, low-elevation desert slopes, canyons, and washes from Palm Springs, California south into Baja California, Mexico.
- **San Diego fairy shrimp (*Branchinecta sandiegonensis*)** – has been listed as a federal endangered species since 1997. It is a small aquatic crustacean that is found in shallow vernal pools from January through March, during years with adequate rainfall. Adult fairy shrimp have a delicate elongated body, large stalked compound eyes, and 11 pairs of swimming legs.
- **Riverside fairy shrimp (*Streptocephalus woottoni*)** – has been listed as a federal endangered species since 1993. It is a small aquatic crustacean that is found in deep, long-lasting vernal pools. Adult fairy shrimp have a delicate elongated body.
- **Laguna Mountains skipper (*Pyrgus ruralis lagunae*)** – has been listed as a federal endangered species since 1997. It is a small member of the skipper butterfly family with a wingspan of about 1 inch. The Laguna Mountains skipper

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	<p>is one of two subspecies of <i>Pyrgus ruralis</i>, and is only known in higher elevation areas of southern California</p> <ul style="list-style-type: none">• Quino checkerspot butterfly (<i>Euphydryas editha quino</i>) – has been listed as a federal endangered species since 1997. It has a wingspread of about 1 inch. The wings are a patchwork of brown, red and yellow spots. It occurs in coastal sage scrub habitat in southern California and northern Baja California.
Federal Threatened Species	<ul style="list-style-type: none">• Coastal California gnat-catcher (<i>Polioptila californica californica</i>) – has been listed as a federal threatened species since 1993. It is one of the three subspecies of the California gnat-catcher (<i>Polioptila californica</i>). This subspecies has two-tone plumage, dark blue-gray in the upper portion and grayish-white in the lower portion. Its tail is black. It lives in the coastal sage scrub plant community.• Western snowy plover (<i>Charadrius alexandrinus nivosus</i>) – has been listed as a federal threatened species since 1993. The western snowy plover is a small shorebird distinguished from other plovers by its small size, pale brown upper parts, dark patches on either side of the upper breast, and dark gray to blackish legs. They are about 5.9 to 6.6 inches long. They breed primarily on coastal beaches.
State Endangered Species	<ul style="list-style-type: none">• Belding's savannah sparrow (<i>Passerculus sandwichensis beldingi</i>) – has been listed as a state endangered species since 1974. The Belding's savannah sparrow is small and brown with fine streaking on the head and face, a pale beige to white belly, and often a dark central breast spot. Its year-round habitats are salt marshes and coastal estuaries where pickleweed, sea blite, and saltgrass are dominant.• Least Bell's vireo (<i>Vireo bellii pusillus</i>) – has been listed as a state endangered species since 1980. For a description, see above.• Light-footed clapper rail (<i>Rallus longirostris levipes</i>) - has been listed as a state endangered species since 1971. For a description, see above.• California least tern (<i>Sterna antillarum browni</i>) - has been listed as a state endangered species since 1971. For a description, see above.• Western yellow-billed cuckoo (<i>Coccyzus americanus occidentalis</i>) – has been listed as a state endangered species since 1988. It is 11-13 inches, and known as a cuckoo by the slim sinuous look, brown back, and white underparts. It currently exists in medium and large riparian habitat patches in California, Arizona, New Mexico, and possibly Mexico.

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	<ul style="list-style-type: none">• Southwestern willow flycatcher (<i>Empidonax trillii extimus</i>) - has been a state listed endangered species since 1995. For a description, see above.• Mohave tui chub (<i>Gila bicolor mohavensis</i>) – has been listed as a state endangered species since 1971. For a description, see above.• Desert pupfish (<i>Cyprinodon macularius</i>) – has been listed as a state endangered species since 1986. For a description, see above.• Unarmored threespine stickleback (<i>Gasterosteus aculeatus williamsoni</i>) – has been listed as a state endangered species since 1970. For a description, see above.
State Threatened Species	<ul style="list-style-type: none">• Stephens' kangaroo rat (<i>Dipodomys stephensi</i>) – For a description, see above.• Barefoot banded gecko (<i>Coleonyx switaki</i>) – has been a state threatened species since 1980. This lizard has a soft, thin, gray brown skin that is composed of fine, granular scales interspersed with larger, smooth, rounded tubercles. On its head the gecko bears a sprinkling of light-colored flecks. It lives on boulder-strewn hillsides of granitic or volcanic outcrops. These hillsides are found in the deserts of San Diego and Imperial counties elevations of 980 to 2050 feet above msl.• Peninsular bighorn sheep (<i>Ovis Canadensis nelsoni dps</i>) - For a description, see above.• California black rail (<i>Rallus longirostris levipes</i>) – has a length of 4.5 inches and is a very small, chunky, short-tailed, round-winged, ground-dwelling marsh bird with a black head, black breast, and brown nape.• Bank swallow (<i>Riparia riparia</i>) – has a length of 4.75 inches, a tiny bill and is the smallest swallow. It has dark brown upperparts, white underparts, with dark breast band and a rump paler than back. It also has a forked tail and is most often seen flying. It nests in cavities near water.
Other Ecological Receptors	Mammals (mountain lions, bats, opossums, coyotes, foxes, skunks, deer, rats, rabbits, and mice), reptiles (lizards, turtles, and rattlesnakes), insects (beetles and butterflies), amphibians (toads, frogs, and salamanders), fish (catfish, sunfish, and bass), and birds (owls, swallows, wrens, hawks, vultures, herons, and ducks).

Table 3.9-2: Species of Concern Listing for San Diego County, California (2005)	
Ecological Receptors	Species
California Department of Fish and Game Species of Concern for San Diego County	<ul style="list-style-type: none">• Arroyo toad (<i>Bufo californicus</i>)• Western spadefoot (<i>Spea hammondi</i>)• Southwestern pond turtle (<i>Actinemys marmorata pallida</i>)• Belding's orange-throated whiptail (<i>Cnemidophorus hyperythrus beldingi</i>)• Coronado Island skink (<i>Eumeces sliktionianus interparietalis</i>)• San Diego horned lizard (<i>Phrynosoma coronatum blainvillei</i>)• Silvery legless lizard (<i>Aniella pulchra pulchra</i>)• Coast patchnose snake (<i>Salvadora hexalepis virgultea</i>)• Northern red-diamond rattlesnake (<i>Crotalus ruber ruber</i>)• Two-striped garter snake (<i>Thamnophis hammondi</i>)• San Diego mountain kingsnake (<i>Lampropeltis zonata pulchra</i>)• Double-crested cormorant (<i>Phalacrocorax auritus</i>)• Least bittern (<i>Ixobrychus exilis</i>)• White-faced ibis (<i>Plegadis chihi</i>)• Northern harrier (<i>Circus cyaneus</i>)• Cooper's hawk (<i>Accipiter cooperii</i>)• Golden eagle (<i>Aquila chrysaetos</i>)• Prairie falcon (<i>Falco mexicanus</i>)• Burrowing owl (<i>Athene cunicularia</i>)• Long-eared owl (<i>Asio otus</i>)• Western snowy plover (<i>Charadrius alexandrinus nivosus</i>)• California horned lark (<i>Eremophila alpestris actia</i>)• Loggerhead shrike (<i>Lanius ludovicianus</i>)• Coastal cactus wren (<i>Campylorhynchus brunneicapillus couesi</i>)• Coastal California gnatcatcher (<i>Polioptila californica californica</i>)• Yellow warbler (<i>Dendroica petechia</i>)• Yellow-breasted chat (<i>Icteria virens</i>)• Southern California rufous-crowned sparrow (<i>Aimophila ruficeps canescens</i>)• Bell's sage sparrow (<i>Amphispiza belli belli</i>)

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	<ul style="list-style-type: none"> • Tricolored blackbird (<i>Agelaius tricolor</i>) • Southern steelhead (<i>Oncorhynchus mykiss irideus</i>) • Pallid bat (<i>Antrozous pallidus</i>) • Western mastiff bat (<i>Eumpos perotis californicus</i>) • Northwest San Diego pocket mouse (<i>Chaetodipus fallax fallax</i>) • Large-blotched salamander (<i>Ensatina klauberi</i>) • Coast Range newt (<i>Taricha torosa torosa</i>) • Mountain yellow-legged frog (<i>Rana muscosa</i>) • Arroyo chub (<i>Gila orcutti</i>) • Tidewater goby (<i>Eucyclogobius newberryi</i>) • California leaf-nosed bat (<i>Macrotus californicus</i>) • Mexican long-tongued bat (<i>Choeronycteris mexicana</i>) • Townsend's big-eared bat (<i>Corynorhinus townsendii</i>) • Pocketed free-tailed bat (<i>Nyctinomops femorosaccus</i>) • Big free-tailed bat (<i>Nyctinomops macrotis</i>) • American badger (<i>Taxidea taxus</i>) • San Diego desert woodrat (<i>Neotoma lepida intermedia</i>) • Flat-tailed horned lizard (<i>Phrynosoma mcallii</i>) • Colorado desert fringe-toed lizard (<i>Uma notata</i>) • Southern grasshopper mouse (<i>Onychomys torridus Ramona</i>) • Pallid San Diego pocket mouse (<i>Chaetodipus fallax pallidus</i>) • Dulzura pocket mouse (<i>Chaetodipus californicus femoralis</i>) • San Diego black-tailed jackrabbit (<i>Lepus californicus bennettii</i>) • Los Angeles pocket mouse (<i>Perognathus longimembris brevinasus</i>) • Pacific pocket mouse (<i>Perognathus longimembris pacificus</i>) • Jacumba pocket mouse (<i>Perognathus longimembris international</i>)
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Table 3.9-3: Summary of T&E Species Known or Suspected at the Detachment Fallbrook, California

Habitat	Species
Coastal Sage Scrub	Least Bell's vireo
	Stephens' kangaroo rat
	Coastal California gnatcatcher
Riparian	Arroyo toad
	Least Bell's vireo
	Southwestern willow flycatcher
Oak Woodlands	None
Eucalyptus Groves	None
Mixed Grassland	Stephens' kangaroo rat
Chaparral	None
Wetlands	San Diego fairy shrimp

4. SUMMARY OF DATA COLLECTION EFFORT

Five primary sources of information were researched as part of the data collection effort for the

PA. The sources of data included:

1. Historical Archives (off-site);
2. Personnel interviews;
3. Installation data repositories;
4. Visual surveys; and
5. Off-site data sources.

These five sources of data are discussed below, along with their relative application to this PA.

4.1. Historical Archives (off-site)

The data collection team reviewed archival records located at the National Archives in College Park, Maryland, and in Washington, D.C. The data collection team researched the following records and record groups (RG) for documents relating to munitions usage at Detachment Fallbrook. Records indicated with an asterisk (*) were copied for review.

Textual Records:

RG 71, Bureau of Yards and Docks

Naval Property Case Files, Boxes 42, 56, 61, and 161

RG 72, Bureau of Aeronautics

Entry 1001-G, Unclassified General Correspondence, 1955, Boxes 206, and 230

Entry 1001-H, Unclassified General Correspondence, 1956, Boxes 195, and 219

Entry 1001-I, Unclassified General Correspondence, 1957, Boxes 202, and 222

Entry 1001-J, Unclassified General Correspondence, 1958, Boxes 156, and 172

Entry 1001-K, Unclassified General Correspondence, 1959, Box 159

RG 74, Bureau of Ordnance

Entry 25-E, General Correspondence, Confidential, 1940-1942, Boxes 181, and 195

Entry 25-F, General Correspondence, Restricted, 1940-1942, Boxes 619, and 790

Entry 25-I, General Correspondence, 1942, Confidential, Box 217

Entry 25-J, General Correspondence, 1942, Restricted, Boxes 591, and 592

Entry 25-M, General Correspondence, 1943, Confidential, Boxes 407 through 409

Entry 25-O, General Correspondence, 1943, Restricted, Boxes 452, 461, 462, 463, 464, 465*, and 703

Entry 25-T, General Correspondence (Bulky enclosures), 1940-1943, Boxes 260, and 288

Entry 25-U, General Correspondence, 1944, Confidential, Boxes 594, 595, and 597

Entry 25-V, General Correspondence, 1944, Restricted, Boxes 807, 1235, 1236*, 1237*, 1238*, 1239*, 1240*, and 1280

Entry 1001, General Correspondence, 1907-1949, Boxes 37, 38, 70, 71, 106, and 107

Entry 1003 A-B, General Correspondence, 1948-1959, Boxes 651*, and 652

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Entry 1003-A, General Correspondence, Unclassified and Confidential, 1948, Boxes 223*, 224*, 225*, and 227
Entry 1003-A, General Correspondence, Unclassified and Confidential, 1949, Boxes 659*, 660*, and 662
Entry 1003-A, (UD), Office of Administration, General Subject Files, Boxes 19*, 20*, and 21

Construction and Procurement Subject Files

1945, Boxes 1539-1542, 1543*, 1544*, 1581, 1582, 1583*, 1584*, and 1587
1946, Boxes 354*, 386, 387*, 388*, 405*, 406*, 407*, 408*, 409*, and 411
1947, Boxes 268*, 269*, 293*, 306*, 307*, 308*, and 482*

RG 80, General Records of the Department of the Navy, 1798 through 1947

Entry 32-G, General Correspondence, Executive Office, 1946 through 1947, Box 430*
Entry 11, Secretary's Office, General Correspondence, Index 1945 through 46, Naval Activities, Boxes 283 through 291
Entry 32-F, Name and Subject Index to General Correspondence of Executive Office of the Secretary of the Navy, 1946 through 47, Boxes 336 through 341
Entry 131-F, Assistant Secretary of the Navy for Air, General Correspondence, 1941 through 1945
Entry 256, Index to Reports from Shore Establishments, 1943, Boxes 1 through 3

RG 127, U.S. Marine Corps, Office of the Commandant

United States Marine Corps Real Estate Files, 1918 through 1976, Box 11

Cartographic Records:

RG 57, U.S. Geological Survey

Quadrangle map series

RG 71, Bureau of Yards and Docks

Maps for facilities, Rolls 1230, and 1196*
Series I microfilm, Rolls 1005, and 1082
Series II microfilm, Reel 892*

RG 77, Department of the Army

Army Mapping Service, AMS, Map V795*

RG 385, Naval Facilities Engineering Command, 1917 through 1989

Architectural and Engineering Plans, Boxes 609, 610, 768*, 769*, 770*, 771*, 772*, and 773
Restricted UIC Architectural and Engineering Plans, Box W34 (60701)

Still Photos:

RG 71, Bureau of Yards and Docks

Entry 71-CB, Construction Projects, 1940 through 1943, Boxes 33, and 132
Entry 71-CP, Construction and Aerials, 1941-1953, Boxes 19, 69, 76*, 82, and 83*

RG 80, Department of the Navy

80-G, Boxes 311, 1533, 1601*, 1801, 1872, 2262*, 2378*, 2382*, 2430, 2549, 2575*, 2582, 2760, and 2857*

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RG 428, Department of the Navy
Entry 428-GX, Index to Photo Files
Series 428-GXA

Naval Historical Center, Washington, DC

Operational archives: Post World War II command histories*

Aviation branch: Post World War II aviation command histories*

Historical Center Library: "U.S. Naval Administrative Histories of World War II"*

Historical maps, aerial photos, documentation, and correspondence were obtained from the repository search. The historical documents provided general information about the installation and the munitions activities performed there over time. The historical maps provided the location of possible MRP ranges/sites.

4.2. Personnel Interviews

The data collection team visited the following offices located at Detachment Fallbrook, unless otherwise indicated, to interview representatives and to research records related to the training and activities that was conducted at the areas of concern:

- Environmental Department
- Facilities Department
- Marine Corps Program Division (MCPD)
- Security Department
- Ordnance Department
- MCB Camp Pendleton Fire Department
- EOD Detachment at MCB Camp Pendleton

A summary of the personnel interviewed and general information obtained from each office is presented below. These interviews focused on the following ranges/sites: the SF Small Arms Range, the QE Test Area, the Salvage Yard Landfill, Dunnage Disposal Site #1, Dunnage Disposal Site #2, Dunnage Disposal Site #3, Dunnage Disposal Site #4, Dunnage Disposal Site #5, the Skeet/Trap Range, Depot Lake, and Lower Lake

Environmental Department – The data collection team interviewed Ms. Pei-Fen Tamashiro, who is currently the Installation Restoration Program Manager. Ms. Tamashiro assisted the data collection team in coordinating the interviews and the visual surveys, providing access to documents and maps, and in presenting the in-brief and the exit brief. Mr. Robbie Knight,

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the Natural Resources Manager, was also interviewed regarding range and munitions activities at the installation. He provided access to several documents and maps relating to these activities, and was a great source of information on the general installation. Mr. Knight also helped the data collection team coordinate interviews. The data collection team also interviewed Ms. Lisa Bosalet, the Cultural Resources Manager, who was a great source of information on the cultural resources at the installation.

Facilities Department – The data collection team interviewed Mr. Kevin Bourelle, who is currently the Head of Facilities at the installation. Mr. Bourelle provided access to historical maps showing range and munitions activities at the installation. Mr. Richard Spinello, the Maintenance Supervisor, was also interviewed.

MCPD – The data collection team interviewed four personnel from the MCPD: Mr. Wayne Ventuleth (Head of the MCPD), Mr. Daniel Reagle (Supervising Engineer Technician), Mr. John Korchick (Mechanical Engineer), and Mr. Jim Francis (Mechanical Engineer). These MCPD personnel provided the data collection team with information on the QE Test Area, where they had all previously worked. They also provided the team with historical documents and maps relating to the QE Test Area and contact information for other interviews.

Security Department – The data collection team interviewed Mr. Ken Scofield from the Security Department at the installation. He was familiar with the SF Small Arms Range and provided useful information to the data collection team. Ms. Leslie Hawkins, a Physical Security Specialist, provided useful information to the team on the security forces activities carried out at the SF Small Arms Range.

Ordnance Department – The data collection team interviewed Mr. Greg Town, who works in Quality Assurance at the Ordnance Department. Mr. Town provided historical information and locations for possible range and munitions sites at the installation.

MCB Camp Pendleton Fire Department – The data collection team interviewed Mr. Kenneth A. Kaptein of the MCB Camp Pendleton Fire Department. Mr. Kaptein provided the team with useful information on the SF Small Arms Range and on the Skeet Range,

where he had participated in activities as part of the Marine Security Department at the installation

EOD Detachment at MCB Camp Pendleton - The data collection team interviewed Master Gunnery Sergeant Samuel Larter, who is an EOD Technician at MCB Camp Pendleton. Master Gunnery Sergeant Larter provided the team with records of EOD responses at Detachment Fallbrook

The data collection team also interviewed several retired personnel from Detachment Fallbrook. They provided the data collection team with very useful information, including locations of potential MRP ranges/sites. The personnel are listed below:

- Lieutenant Commander (LCDR) Tom Curtis (Retired), Assistant Commanding Officer at Detachment Fallbrook from 1974 to 1977 and Commanding Officer from 1977 to 1980
- Mr. Don McNamara, former Special Weapons Officer from 1974 to 1976
- Mr. Bill Houlder, former Facilities Officer from 1973 to 1976.
- Commander James H. Owens (Ret), formerly in charge of Detachment Fallbrook from 1962 to 1965.
- Mr. Buddy Ingram, former Technician with the Ordnance Department, and subsequently the Head of the Security Department from 1978 to 1994
- Commander Reginald Fogg (Ret), formerly in charge of Detachment Fallbrook from 1965 to 1970.

4.3. Installation Data Repositories

The data collection team reviewed reports, files, and drawings located in the environmental office at Detachment Fallbrook and made available for review at the site. The team made copies of reports and files of interest, including historical munitions reports, IRP investigation reports, and ecological risk assessments. The team copied documents relating to Detachment Fallbrook IRP activities at the environmental office. The team searched map and flat files at the Detachment Fallbrook Facilities and Engineering offices' vaults for historical maps and aerial photos showing the former ranges.

4.4. Visual Surveys

The data collection team conducted a visual survey of each site/range as part of the data collection effort for the PA. The purpose of the visual survey was to identify any MEC-related materials (e.g., expended rounds, fragmentation, range debris, old targets), any evidence of MC (such as ground scarring, stressed vegetation, or chemical residue), and/or surface features that could provide additional information to aid in the characterization of the site. The visual survey was also used to enhance, augment, or confirm the archival data and, in some cases, to provide new data to the team.

The SF Small Arms Range and the Skeet/Trap Range are moderate in size, as are the five Dunnage Disposal Sites, so the team surveyed the accessible areas of each range. The QE Test Area and the Salvage Yard Landfill are large sites. The team surveyed the sites by walking the perimeter of the sites, then walking several transects across the sites. Both Depot Lake and Lower Lake are water sites, so the team walked the accessible perimeters of each lake. A description of the area surveyed and the results of the survey are provided for the SF Small Arms Range, the QE Test Area, the Salvage Yard Landfill, the Dunnage Disposal Site #1, the Dunnage Disposal Site #2, the Dunnage Disposal Site #3, the Dunnage Disposal Site #4, the Dunnage Disposal Site #5, the Skeet/Trap Range, Depot Lake, and Lower Lake in Sections 5.1.2 through 5.11.2.

4.5. Off-Site Data Sources

The data collection team reviewed the archives at the Naval Facilities Engineering Command (NAVFAC) Historian's office at Port Hueneme. It provided the data collection team with access to historical documentation of Detachment Fallbrook, including aerial photographs and site maps. The data collection team made copies of the maps, photographs, and reports of interest to this PA.

5. SITE CHARACTERISTICS

The following sections provide site-specific information about each of the nine former ranges and sites located on Detachment Fallbrook, including history and site description; land use; access controls and restrictions; visual survey observations; contaminant migration routes; and receptors. The SF Small Arms Training Range, the QE Test Area, the Salvage Yard Landfill, the Dunnage Disposal Site #1, the Dunnage Disposal Site #2, the Dunnage Disposal Site #3, the Dunnage Disposal Site #4, the Dunnage Disposal Site #5, the Skeet/Trap Range, Depot Lake, and Lower Lake are discussed in sections 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10, and 5.11, respectively.

5.1. SF Small Arms Training Range

The SF Small Arms Training Range (hereafter called the SF Small Arms Range) is located northeast of Building 366, in the eastern center of Detachment Fallbrook. The range occupies approximately 0.4 acres. Building 366 is currently not in use. Map 2 1-1 shows the location of the site on Detachment Fallbrook and its boundaries.

5.1.1. History and Site Description

The SF Small Arms Range was used from 1945 to 1991 by both the Marine Security Forces (from 1945 to 1988) and the civilian Security Forces (from 1987 to 1991) for handgun marksmanship training. It was also used by station civilians and local law enforcement officers. Munitions used at the range include .38-caliber, .45-caliber, and 9-mm rounds. The SF Small Arms Range was closed in 1991 due to the proximity of the main administration areas of the installation and the town of Fallbrook.

The SF Small Arms Range was oriented for firing to the southwest, with the firing points located on the northernmost portion of the range. MC would likely be located throughout the range fan, including in the soil from the former backstop berm, in surface soils located adjacent to the berm, and near the firing line. The guns were fired at targets positioned in front of a natural soil berm. No firing line was observed during the site survey. Some of the wooden target frames and the natural target berm are still intact, as are the remnants of a shed that was used to store the targets. The area is not currently in use. Figure 5 1-1 shows a view of the SF Small Arms Range.

Natural Berm

Figure 5.1-1: Photograph was taken during the September 2004 on-site visual survey. View is looking southwest at the remnants of a target frame and the natural berm.

According to Army Technical Manuals (referenced as AR 750-10 and TM 9-855) and the Navy Programming Guide (1958), a typical pistol range was approximately 30 yards wide by 50 yards deep. The range would have been comprised of the firing line, targets, earthen berms, and an area behind the firing line that included the ammunition issue point. The backstop berm was typically constructed along the backside of the range, approximately five feet to the rear of the targets. A five degree angle of fire extended from the firing line down range a distance of 4,800 feet, with an additional 25 degree safety fan (on both sides) extending down range 3,600 feet. The Surface Danger Zone (SDZ), which included the down range hazard area and the safety fan, was roughly diamond-shaped and contained approximately 224 acres. An example of a typical SDZ for a 0.45 caliber pistol range is provided in Figure 5.1-2.

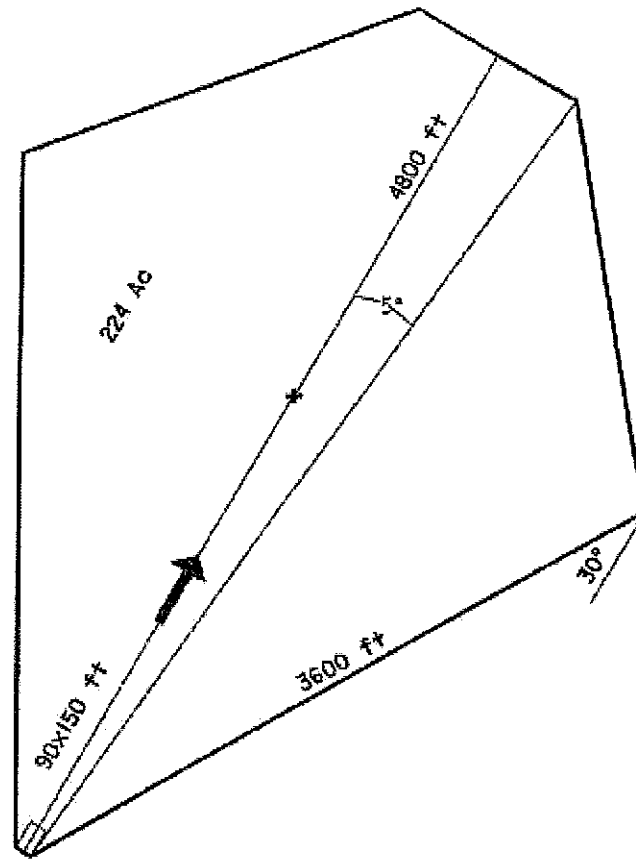


Figure 5.1-2: SDZ for a typical 0.45 caliber pistol range

The site boundary for the SF Small Arms Range encompasses the target areas and the berm at the site. The site includes the area where the bullets and bullet fragments were observed. Whereas, the SDZ represented the portion of the former range that included the area where the weapons, when fired from the firing line, were a potential hazard to personnel. The SDZ was used to define the area that included the firing line, target areas, impact area (i.e., berm), ricochet trajectory area, and secondary danger area. The SDZ for the SF Small Arms Range is shown in Map 5.1-2. The acreage for the SDZ is approximately 220 acres.

5.1.1.1. Topography

The SF Small Arms Range is primarily flat, except for the hills on the southern boundary of the range that form the natural berm. For further information on the topography of Detachment Fallbrook, see Section 3.2.

5.1.1.2. Geology

Site-specific geology for the SF Small Arms Range is unknown. No data from soil borings is available. Section 3.3 includes a general description of the geology of Detachment Fallbrook.

5.1.1.3. Soil and Vegetation Types

The soil at the SF Small Arms Range is classified as a sandy loam of granitic origin and is moderately well drained. Section 3.4 includes a general description of the soil types at Detachment Fallbrook.

The vegetation in the area of the SF Small Arms Range is considered to be part coastal sage scrub and part mixed grassland, with a eucalyptus grove nearby. Common species in coastal sage scrub habitat include coastal sagebrush (*Artemisia californica*), flat-topped buckwheat (*Eriogonum fasciculatum*), laurel sumac (*Malosma laurina*), sage (*Salvia* spp.), goldenbush (*Isocoma menziesii*), and native grasses (*Nassella* spp.). Species in mixed grassland habitat are mostly native, perennial bunch grasses, such as *Nassella* spp., mixed with nonnative annuals. Section 3.5 includes a general description of the vegetation types at Detachment Fallbrook.

5.1.1.4. Hydrology

The SF Small Arms Range is in the Santa Margarita watershed. The installation includes a central plateau, where the SF Small Arms Range is located. The plateau drains primarily into Fallbrook Creek, about 40 feet north and northwest of the former range's boundary. Fallbrook Creek would naturally be an intermittent or ephemeral stream, but due to runoff from agricultural and urban irrigation, it is now a perennial stream. Section 3.6 includes a general description of the hydrology at Detachment Fallbrook.

5.1.1.5. Hydrogeology

No site-specific groundwater depth data were available. Section 3.7 includes a general description of the hydrogeology at Detachment Fallbrook.

5.1.1.6. Cultural and Natural Resources

The data collection team for the SF Small Arms Range area found no documentation of significant cultural resources within or near the former range. Detachment Fallbrook has large areas of undisturbed land that can serve as suitable habitat to threatened and endangered species.

Section 3.8 includes a general description of the cultural and natural resources at Detachment Fallbrook

5.1.1.7. Endangered and Special Status Species

Threatened and endangered species data for Detachment Fallbrook are presented in Section 3.9. The on-site coastal sage scrub vegetation, grasslands, and the nearby eucalyptus grove offer roosting, foraging, and nesting resources for raptors. According to the California Wildlife and Habitat Analysis Branch, threatened and endangered species associated with the critical habitats of the former range that are known or have been documented within or adjacent to the Detachment Fallbrook are the coastal California gnatcatcher, Least Bell's vireo, and Stephens' kangaroo rat.

5.1.2. Visual Survey Observations and Results

The data collection team conducted a visual survey of the SF Small Arms Range on 29 September 2004. Present during the visual survey were Mr. Chip Poalinelli, Mr. Al Larkins, and Mr. Scott Lehman, and Navy representatives (Ms. Pei-Fen Tamashiro, Mr. Robbie Knight, and Mr. Si Le). The field team conducted the visual survey by walking the perimeter of the entire range, and then walking several transects across it. During the visual survey, several ammunition fragments consistent with small arms were observed on the natural berm. Some of the wooden target frames and the natural target berm are still intact on the SF Small Arms Range. The remnants of a shed that was used to store the targets were also observed during the site survey. The survey team did not find any evidence of MEC during the visual survey. Figure 5.1-2 shows some of the ammunition fragments consistent with small arms observed on the natural berm. The site reconnaissance path is shown on Map 5.1-1, at the end of Section 5.1. Additional range details are illustrated on Map 5.1-2, also at the end of Section 5.1.

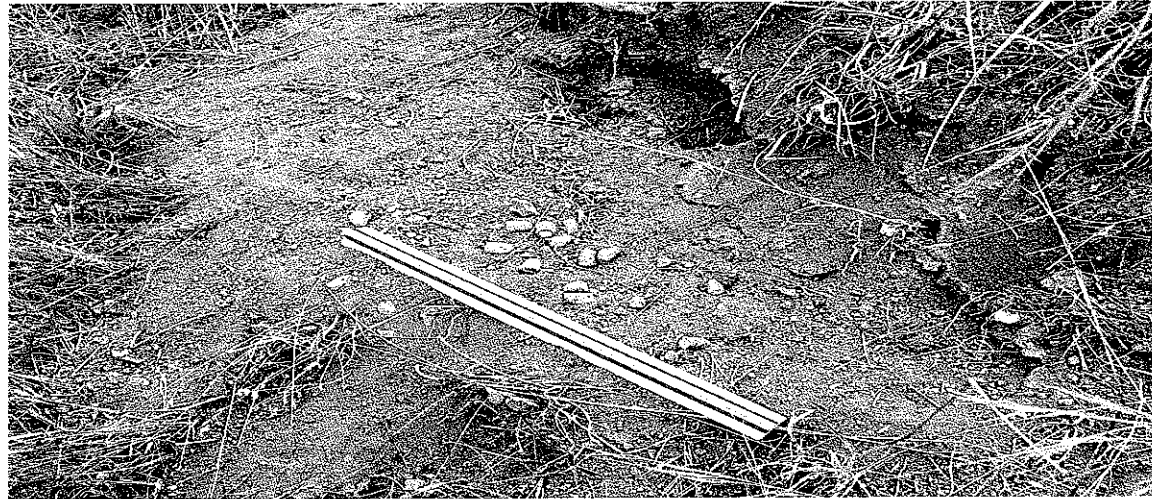


Figure 5.1-3: Photograph was taken during the September 2004 on-site visual survey. View is showing ammunition fragments consistent with small arms on the natural berm at the SF Small Arms Range.

5.1.3. Munitions and Munitions Related Materials Associated with the Site

This section describes the munitions and munitions related materials, including the types and estimated maximum penetration depths, known or suspected to be at the former range. This includes both MEC and non-hazardous munitions related scrap (e.g., fragments, base plates, and inert mortar fins).

The data collection team was able to determine the types of munitions that were used at the SF Small Arms Range from personnel interviews and the limited visual survey. The available technical data sheets on these items are included in Appendix D. The munitions types used at the range include .38-caliber, .45-caliber, and 9-mm rounds.

Based on the information obtained during the data collection process, the SF Small Arms Range is not suspected to contain chemical warfare material (CWM) filled munitions, electrically fused munitions, or depleted uranium (DU) associated munitions.

5.1.4. MEC Presence

The entire former range has been subdivided and categorized into one of three levels of MEC presence including: Known MEC Areas, Suspected MEC Areas, and Areas Not Suspected to Contain MEC to indicate that MEC is known or is suspected to be at the former range. Map 5-1-3

illustrates the munitions characterization of the SF Small Arms Range, and is provided at the end of Section 5.1. The MEC presence is discussed below

5.1.4.1. Known MEC Areas

There are no Known MEC Areas associated with the SF Small Arms Range since the site was used only for small arms training. There is no historical or known evidence of explosives used at the site, so there is no evidence of MEC

5.1.4.2. Suspected MEC Areas

There are no Suspected MEC Areas associated with the SF Small Arms Range since the site was used only for small arms training. There is no historical or known evidence of explosives used at the site, so there is no evidence of MEC

5.1.4.3. Areas Not Suspected to Contain MEC

Based on observations made and data collected during the PA process, the 0.4-acre site, as well as the SDZ associated with the SF Small Arms Range, is not suspected to contain MEC

5.1.5. Ordnance Penetration Estimates

The depth to which munitions penetrate below the ground surface depends on many factors, including the type of soil, the angle of impact, the size of the munitions, the velocity at impact, and site-specific environmental conditions. Over the years, the DoD has studied and modeled munitions penetration depths and has issued various guidance and technical documents on the subject. The technical documents, however, apply to air dropped and indirect fire weapons and do not apply to small arms ranges. By design, a small arms range is a directed fire training range and normally has a backstop (impact) berm located behind the target area that receives/contains the projectiles (bullets) expended on the range. Depending on berm composition, the penetration depths into the backstop berm range from surface to 12 inches. At the SF Small Arms Range, small arms munitions fragments were observed on the surface of the natural berm. Because the range was designed such that small arms ammunition was fired toward targets and retained onsite by the backstop berm, expended rounds are not expected to have penetrated the ground surface or accumulated beyond the berm.

5.1.6. Munitions Constituents

MC associated with small arms activities could be present at the SF Small Arms Range. Small arms ammunition is composed mostly of lead (approximately 85% by weight), which is the primary munitions constituent at small arms ranges. Other MCs include antimony, arsenic, copper, nickel, zinc, and constituents associated with black or smokeless powder. According to installation personnel, surface soil sampling at the SF Small Arms Range has not occurred.

5.1.7. Contaminant Migration Routes

Migration of MC may occur through surface soil erosion due to runoff and wind. Future construction, excavation, and maintenance at the site are also potential release mechanisms. MC in runoff could potentially end up in surface water or sediment. MC could also potentially leach through soils or surface waters to groundwater.

5.1.8. Receptors and Pathways

Potential receptors at the SF Small Arms Range include Navy personnel, visitors, private contractors, and ecological receptors. Ecological receptors may come into direct contact with MC in soil while foraging or burrowing. Ecological receptors may also come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and prey). There is also a potentially complete exposure pathway for the general public coming into contact with MC migrating off the installation through the surface water system.

5.1.8.1. Nearby Populations

Fallbrook and San Diego County have populations of 29,100, and 2,813,833, respectively (U S Census Bureau, 2000). The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. The SF Small Arms Range is approximately 8,200 feet from the housing complex at the installation. See Section 2.1 for more information on the housing complex.

5.1.8.2. Buildings Near/Within Site

There are currently no buildings on the SF Small Arms Range, other than the remnants of a shed that was used to store the targets. Building 366 is the only building in the SDZ and approximately 2,790 feet southwest of the SF Small Arms Range, as shown on Map 5.1-2. As mentioned earlier, the building is not currently in use and is on a list to be demolished. The

eastern boundary of Detachment Fallbrook is approximately 1,395 feet away. Beyond the Detachment's boundary lies the Town of Fallbrook. Figure 5.1-3 shows the remnants of the shed on the SF Small Arms Range

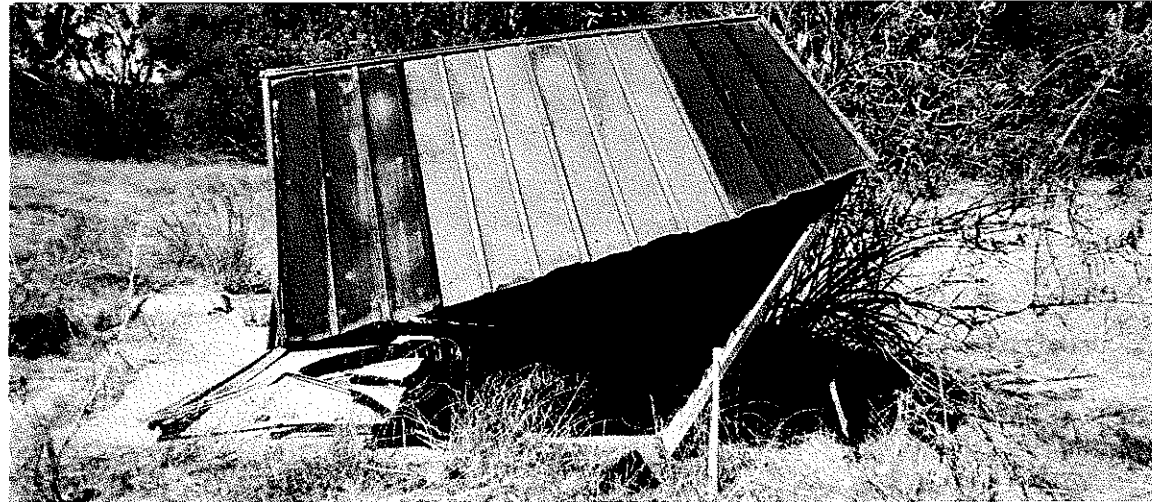


Figure 5.1-4: Photograph was taken during the September 2004 on-site visual survey. View is showing the remnants of a shed that was used to store the targets.

5.1.8.3. Utilities On/Near Site

While there are no utilities on-site, there are some utility lines near the site. U.S. government underground phone lines are located within 0.2 miles of the western boundary of the site. Just inside the southwest-northeast trending installation fence line, approximately 0.2 miles from the site, is a Fallbrook Sanitation District sewer line.

5.1.9. Land Use

The area was formerly used as a small arms range. Current activities are limited to environmental and ecological surveys. Potential future land use activities must address the issue of the proximity of the main administration areas of the installation and from the town of Fallbrook, and follow any Navy ESQD waivers or exemptions.

5.1.10. Access Controls / Restrictions

The SF Small Arms Range is located on Detachment Fallbrook, which is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order, and for implementing access control policies and procedures. Access to the SF Small Arms Range from within Detachment Fallbrook is controlled by a locked fence.

5.1.11. Conceptual Site Model

This Conceptual Site Model (CSM) was developed following guidance documents issued by the USEPA for hazardous waste sites and the U.S. Army Corps of Engineers (USACE) for Ordnance and Explosives (OE) sites. Guidance documents used in the development of this CSM include the USEPA’s Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA/540/G-89/004) and the Final USACE CSM Guidance Development of Integrated Conceptual Site Models for Environmental OE Sites (USACE, 2003)

The CSM describes the site and its environmental setting, and presents information regarding: 1) MEC and/or MC known or suspected to be at the site; 2) current and future reasonably anticipated or proposed uses of the real property; and 3) actual, potentially complete, or incomplete exposure pathways that link MEC and/or MC to receptors.

The CSM is presented in a series of information profiles that provide information about the site. The information profiles are included in Table 5.1-1 below.

Table 5.1-1: Conceptual Site Model Information Profiles –SF Small Arms Range		
Profile Type	Information Needs	Preliminary Assessment Findings
Range Profile	Installation Name	Detachment Fallbrook
	Installation Location	Detachment Fallbrook is located 53 miles north of San Diego in northern San Diego County, CA.
	Range Name	SF Small Arms Training Range
	Range Location	The SF Small Arms Range is located in the central plateau of the installation, near the eastern border, just northeast of Building 366. Building 366 is not currently in use and is on a list to be demolished.
	Range History	The SF Small Arms Range was used from 1945 to 1991. It was used by both the Marine Security Forces (from 1945 to 1988) and the civilian Security Forces (from 1987 to 1991) for handgun marksmanship training. It was also used by station civilians and local law enforcement officers. The SF Small Arms Range was closed due to the proximity of the main administration areas of the installation and the town of Fallbrook.

Table 5.1-1: Conceptual Site Model Information Profiles –SF Small Arms Range

Profile Type	Information Needs	Preliminary Assessment Findings
	Range Area and Layout	The SF Small Arms Range occupies approximately 0.4 acres. The range was oriented for firing to the southwest. The guns were fired at targets positioned in front of a natural soil berm. No firing line was observed during the site survey.
	Range Structures	Some of the wooden target frames and the soil berm are relatively intact on the former range. The remnants of a shed that was used to store the targets can also be seen on the range.
	Range Boundaries	Map 2.1-1 shows the location of the former range. N: A line of eucalyptus trees gives way north to Fallbrook Creek, which is approximately 40 feet away from the range's northern boundary. S: Shrubs and grassland extend southwest towards Building 366, which is approximately 2,790 feet away from the range's southern boundary. W: Trees, shrubs and grassland extend west towards Fallbrook Creek, which is approximately 65 feet away from the range's western boundary. E: Trees, shrubs and grassland extend to the eastern boundary of Detachment Fallbrook, which is approximately 1,395 feet away from the range's eastern boundary. Beyond the Detachment's boundary lies the Town of Fallbrook.
	Range Security	The SF Small Arms Range is located on Detachment Fallbrook, which is a fenced and guarded installation. Access to the SF Small Arms Range from within Detachment Fallbrook is controlled by a locked fence.
	Munitions Types	The former range was used for handgun marksmanship training. The munitions types used at the range include .38-caliber, .45-caliber, and 9-mm rounds.
Munitions/ Release Profile	Maximum Probability Penetration Depth	The penetration depths into the natural berm range from zero to 12 inches. During the site survey, expended shells were observed on the natural berm.
	MEC Density	None; no evidence of MEC; small arms use only.
	MEC Scrap/Fragments	None.

Table 5.1-1: Conceptual Site Model Information Profiles –SF Small Arms Range

Profile Type	Information Needs	Preliminary Assessment Findings
	Associated Munitions Constituents	Small arms ammunition is mainly composed of lead (approximately 85% by weight), which is the primary munitions constituent at small arms ranges. Other MCs include antimony, arsenic, copper, nickel, zinc, and constituents associated with black or smokeless powder. Based on discussions with installation personnel, surface soil sampling at the SF Small Arms Range has not occurred.
	Migration Routes/Release Mechanisms	Migration of MC may occur through surface soil erosion due to runoff and wind. Future construction, excavation, and maintenance at the site are also potential release mechanisms. MC in runoff could potentially end up in surface water or sediment. MC could also potentially leach through soils or surface waters to groundwater.
Physical Profile	Climate	The climate at Detachment Fallbrook is typical of the prevailing coastal southern California Mediterranean climate and is characterized by mild winters, cool summers, and infrequent rainfall. The annual average temperature is 63 °F. Precipitation ranges from 13.7 to 17.1 inches per year, with January being the wettest month and July the driest. Summers at the installation are punctuated by the Santa Ana (offshore) winds.
	Topography	The SF Small Arms Range is mainly flat, except for the hills on the southern boundary of the range that form the natural berm.
	Geology	The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information was not available.
	Soil	The soil at the SF Small Arms Range is classified as a sandy loam of granitic origin and is moderately well drained.
	Hydrogeology	No site-specific groundwater depth data were available.
	Hydrology	The SF Small Arms Range is in the Santa Margarita watershed. The central plateau of the installation, where the SF Small Arms Range is located, drains primarily into Fallbrook Creek, about 40 feet to the north and northwest of the former range's boundary.
	Vegetation	The vegetation in the area of the SF Small Arms Range is considered to be part coastal sage scrub and part mixed grassland, with a eucalyptus grove nearby.

Table 5.1-1: Conceptual Site Model Information Profiles –SF Small Arms Range		
Profile Type	Information Needs	Preliminary Assessment Findings
Land Use and Exposure Profile	Current Land Use	The SF Small Arms Range is closed and is no longer in use.
	Current Human Receptors	Navy personnel and Navy-permitted visitors (including contractors). There is also a potentially complete exposure pathway for the general public coming into contact with MC migrating off the installation through the surface water system.
	Current Activities (frequency, nature of activity)	Activities at the range may include environmental and ecological surveys
	Potential Future Land Use	There is no land use change planned.
	Potential Future Human Receptors	Navy personnel and Navy-permitted visitors (including contractors). There is also a potentially complete exposure pathway for the general public coming into contact with MC migrating off the installation through the surface water system.
	Potential Future Land Use-Related Activities:	Potential future land use activities must address the issue of the proximity of the main administration areas of the installation and the town of Fallbrook, and follow any Navy ESQD waivers or exemptions. Other future activities at the range could include environmental and ecological surveys
	Zoning/Land Use Restrictions	ESQD Arc restrictions apply to the area of the former SF Small Arms Range
	Demographics/Zoning	The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. Demographic data include the following: <ul style="list-style-type: none"> Town of Fallbrook: Population (U.S. Census, 2000): 29,100 San Diego County: Population (U.S. Census, 2000): 2,813,833
Ecological Profile	Beneficial Resources	The on-site coastal sage scrub vegetation, grasslands, and the nearby eucalyptus grove offer roosting, foraging, and nesting resources for raptors.
	Habitat Type	The types of habitats associated with the SF Small Arms Range include coastal sage scrub, mixed grasslands, and eucalyptus.

Table 5.1-1: Conceptual Site Model Information Profiles –SF Small Arms Range

Profile Type	Information Needs	Preliminary Assessment Findings
	Degree of Disturbance	Current and anticipated future activities at the range, such as environmental and ecological surveys, may disturb habitat and or ecological receptors known or potentially present within range areas.
	Ecological Receptors	
	General:	Common fauna include mammals (opossums, coyotes, gophers, skunks, deer, rats, rabbits, and mice), reptiles (lizards, turtles, and rattlesnakes), insects (beetles and butterflies), amphibians (toads, frogs, and salamanders), and birds (owls, finches, wrens, hawks, vultures, and sparrows).
	Federal Endangered Species:	Least Bell's vireo and Stephens' kangaroo rat
	Federal Threatened Species:	Coastal California gnatcatcher
	State Endangered Species:	Least Bell's vireo
	State Threatened Species:	Stephens' kangaroo rat
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	Potential human receptors at the SF Small Arms Range include Navy personnel, visitors, and private contractors. Ecological receptors may come into direct contact with MC in soil while foraging or burrowing. Ecological receptors may also come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and prey). There is also a potentially complete exposure pathway for the general public coming into contact with MC migrating off the installation through the surface water system.

A key element of the CSM is the exposure pathway analysis, which is performed separately for MEC and for MC.

For MEC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MEC are expected to be found); 2) access (e.g., controlled or uncontrolled access, items on the surface or within the subsurface); 3) an activity (e.g., non-intrusive grounds maintenance or intrusive construction); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, authorized visitors, or ecological receptors). It is important to recognize that environmental mechanisms (e.g., erosion) and/or human intervention may result in the repositioning of MEC.

For MC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MC are expected to be found); 2) an exposure medium (e.g., surface soil); 3) an exposure route (e.g., dermal contact); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, authorized visitors, or ecological receptors). If the point of exposure is not at the same location as the source, the pathway may also include a release mechanism (e.g., volatilization) and a transport medium (e.g., air).

The potential interactions between the source and receptors are assessed differently between MEC and MC. For MC, interaction between the source and receptors involves a release mechanism for the MC, an exposure medium that contains the MC, and an exposure route that places the receptor into contact with the contaminated medium. For MEC, interaction between the potential receptors and an MEC source has two components. The receptor must have access to the source and must engage in some activity that results in contact with individual MEC items within the source area.

MEC Interactions and Pathway Analysis

No exposure pathway analysis for MEC was prepared for the SF Small Arms Range because it is not suspected to contain MEC. Historical and visual evidence indicate that MEC are not present at the SF Small Arms Range. The site was a small arms range and no evidence has been found that would indicate MEC at the site.

MC Interactions and Pathway Analysis

The exposure pathway analysis for MC is shown in Figure 5.1-5. Potential receptors include both human (Navy personnel and contractor/visitor) and ecological receptors (biota) that may come in contact with MC in the source medium or other potentially contaminated media from the site. Pathways are shown for each medium and are discussed below. For MC, interaction between the source (e.g., the berm) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, runoff to surface water, or leaching to groundwater), an exposure medium containing the MC (e.g., soil, sediment, groundwater), and an exposure route (e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium.

Surface Water/Sediment

As discussed earlier, Fallbrook Creek is about 40 feet from the northwestern border of the SF Small Arms Range. This creek and its tributaries are used for fish and wildlife enhancement and for wildfire protection. The exposure pathway for surface water and/or sediment is considered potentially complete for human receptors through dermal contact, and for biota living in or near the creek and its tributaries. Navy personnel and contractors may be exposed during site investigations or from potential future land use changes that may require construction. Biota on the site may disturb the sediment through nesting or feeding. MC could affect biota that might ingest the potential MC or absorb it through dermal contact. There is a potentially complete pathway for the general public for any MC that flows out of the installation through the surface water system.

Plant/Animal Uptake

Potentially complete pathways are indicated for biota (wildlife) exposed to MC at the SF Small Arms Range via the food chain. MC may be taken up by plants and prey consumed by biota at the former range.

Surface Soil

Potentially complete pathways exist for all receptors (except for the general public) via all exposure routes for surface soil contaminated with MC at the SF Small Arms Range. It is possible that MC remains in the surface soil (i.e., 0 to 2 feet below ground surface). Exposures to humans and biota from inhalation of dust are anticipated due to the low vegetative cover on the soils. Any future movement or grading of surface soils could make MC available for wind distribution and subsequent inhalation.

Subsurface Soil

The potential for subsurface soil impacts at the SF Small Arms Range is considered to be low, as the contaminants associated with small arms ammunition and range activities are not likely to migrate to subsurface soil. The subsurface soil exposure pathway is considered to be potentially complete for biota and for Navy personnel and contractors. Biota might come into contact with the contaminated soil by burrowing and/or ingesting. Navy personnel and contractors might engage in excavation or drilling activities, during environmental investigations or ecological surveys.

Groundwater

The potential for groundwater impacts at the SF Small Arms Range is considered to be low, as the contaminants associated with small arms ammunition and range activities are not likely to migrate to subsurface soil, and then to groundwater. Potentially complete pathways for Navy personnel and contractors/visitors are indicated for groundwater contaminated with MC at the SF Small Arms Range. Navy personnel and contractors/visitors may come into contact with groundwater during environmental investigations (i.e. monitoring well installation and sampling) at the former range. The potential for groundwater impacts is considered to be incomplete for all other receptors.

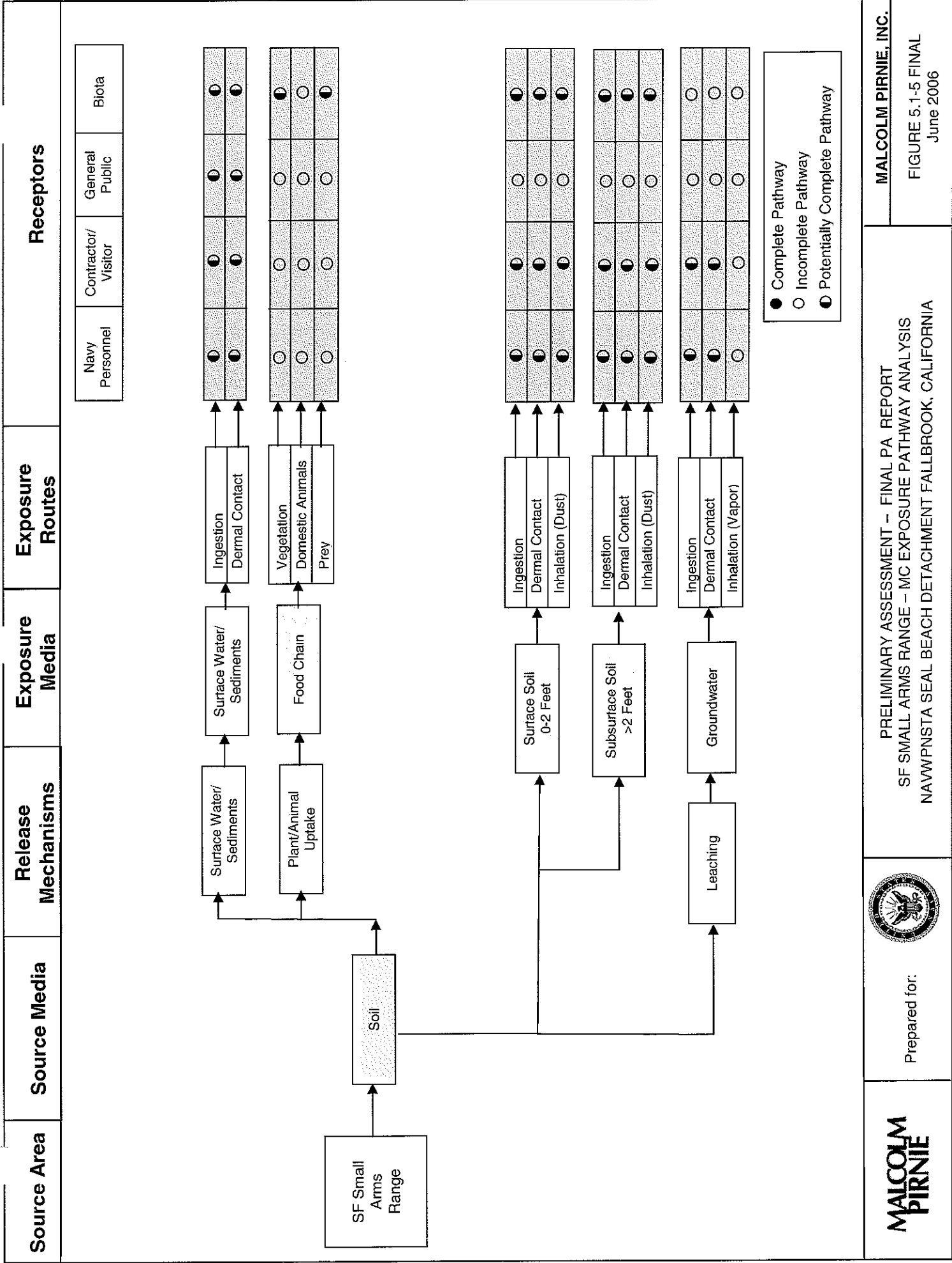
An exposure pathway does not exist for MC volatilizing into the air for all receptors.

5.1.12. Summary

The 0.4-acre SF Small Arms Range is located northeast of Building 366, in the eastern center of Detachment Fallbrook. The SF Small Arms Range was used from 1945 to 1991 by both the Marine Security Forces (from 1945 to 1988) and the civilian Security Forces (from 1987 to 1991) for handgun marksmanship training. It was also used by station civilians and local law enforcement officers. The guns were fired at targets positioned in front of a natural soil berm. No firing line was observed during the site survey. The SF Small Arms Range was closed in 1991 due to the proximity of the main administration areas of the installation and the town of Fallbrook. Munitions used at the range include 38-caliber, 45-caliber, and 9-mm rounds. No evidence was found indicating the presence of MEC on the site. Since the range was used for small arms, the range is not suspected to contain MEC. The potential for MC, specifically lead, exists at the site. Several ammunition fragments consistent with small arms were observed on the natural berm.

5.1.13. Recommendations

Based on the data collected and presented in this PA, No Further Action (NFA) for MEC is recommended at the SF Small Arms Range. MEC is not anticipated at small arms ranges. A Site Inspection (SI) is recommended at the SF Small Arms Range with respect to MC. During the SI, it is recommended that surface and subsurface soils be sampled for the full metal spectrum.





Preliminary Assessment
NAWPNSTA Seal Beach
Detachment Fallbrook, California



MALCOLM
PIRNIE

Map 5.1-1
Visual Survey
Security Forces Small Arms Range

Legend

-  Security Forces Small Arms Range
-  Site Reconnaissance Path

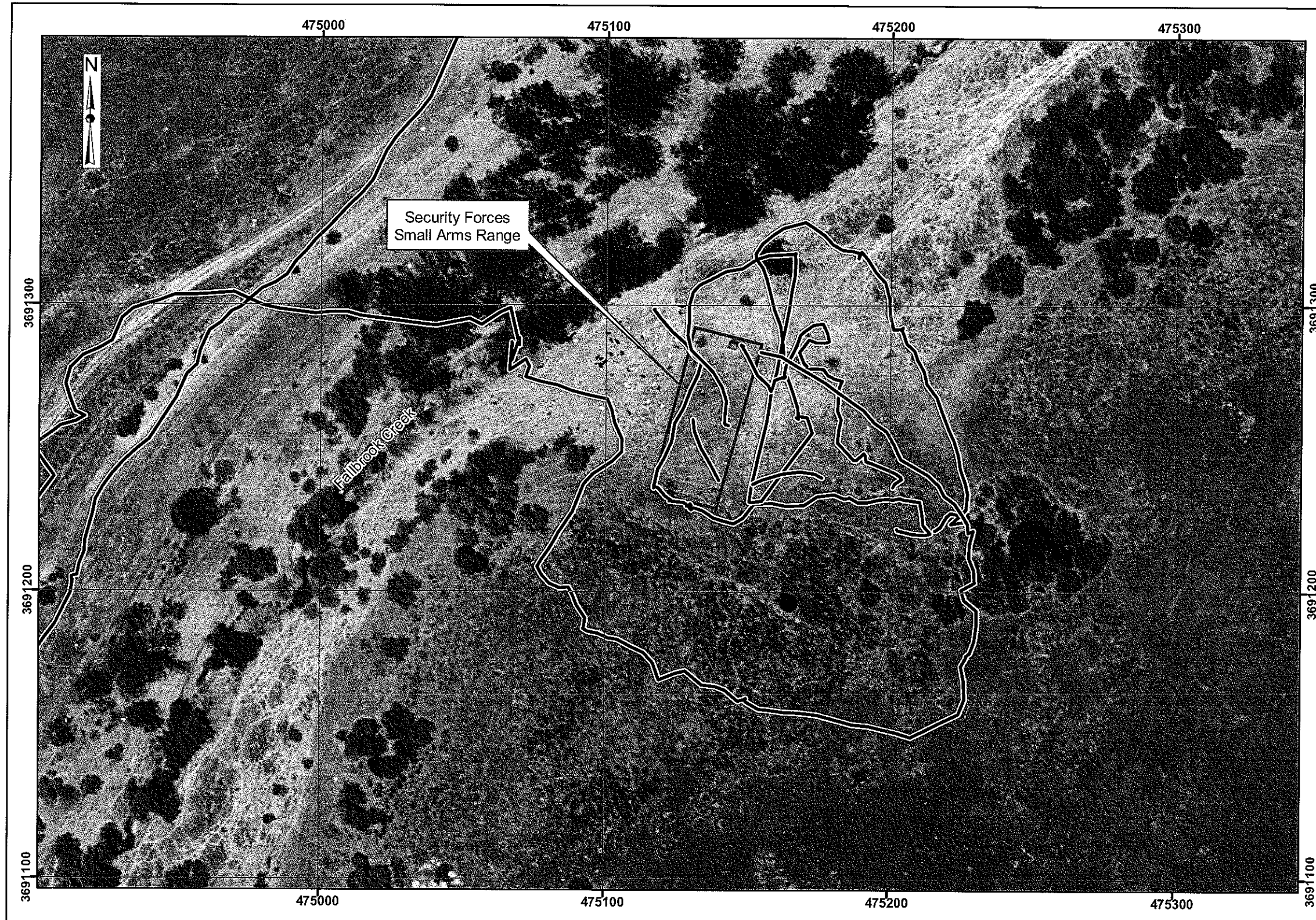
0 35 70 Meters



Data Source: Anteon Corporation,
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006




Preliminary Assessment
 NAVWPNSTA Seal Beach
 Detachment Fallbrook, California



**MALCOLM
 PIRNIE**

Map 5.1-2
 Site Details
 Security Forces Small Arms Range

Legend

-  Installation Boundary
-  Security Forces Small Arms Range
-  Streams
-  Topographic Contours (ft above MSL)
-  Target Area
-  Firing Line

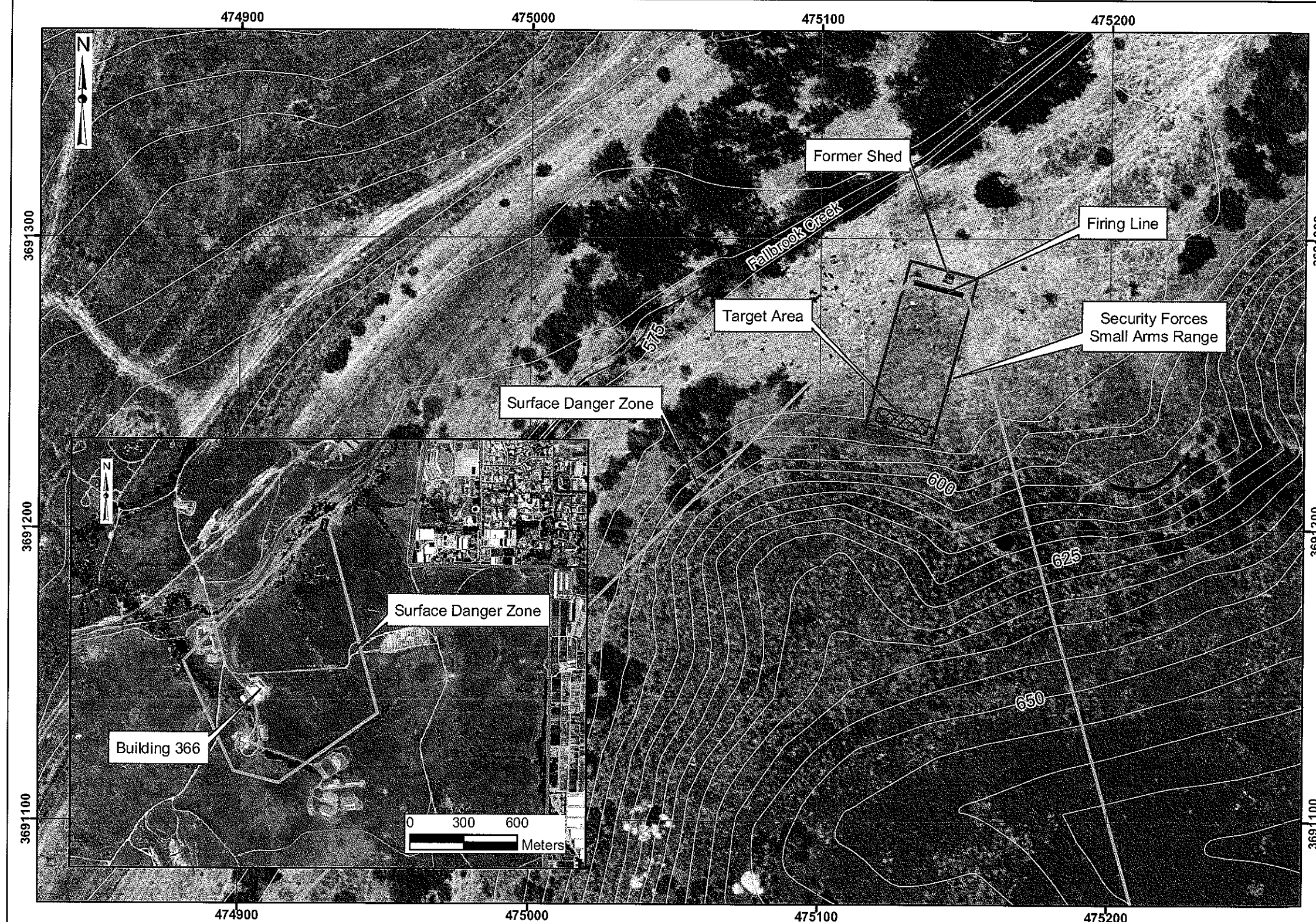
0 35 70 Meters

Data Source: Anteon Corporation,
 Orthophoto, June 3, 2004
 NAVWPNSTA Seal Beach GIS Data
 vector data set, 2005

Coordinate System: UTM Zone 11
 Datum: NAD 83
 Units: Meters

Contract: N62472-02-D-1300
 Edition: Final Preliminary Assessment
 Date: June 2006

NAVWPNSTA Seal Beach
 Detachment Fallbrook, California
 Security Forces
 Small Arms Range



Preliminary Assessment
NAWPNSTA Seal Beach
Detachment Fallbrook, California



MALCOLM
PIRNIE

Map 5.1-3
Munitions Characterization
Security Forces Small Arms Range

Legend

 Security Forces Small Arms Range

MEC Presence*

 Known

 Suspect

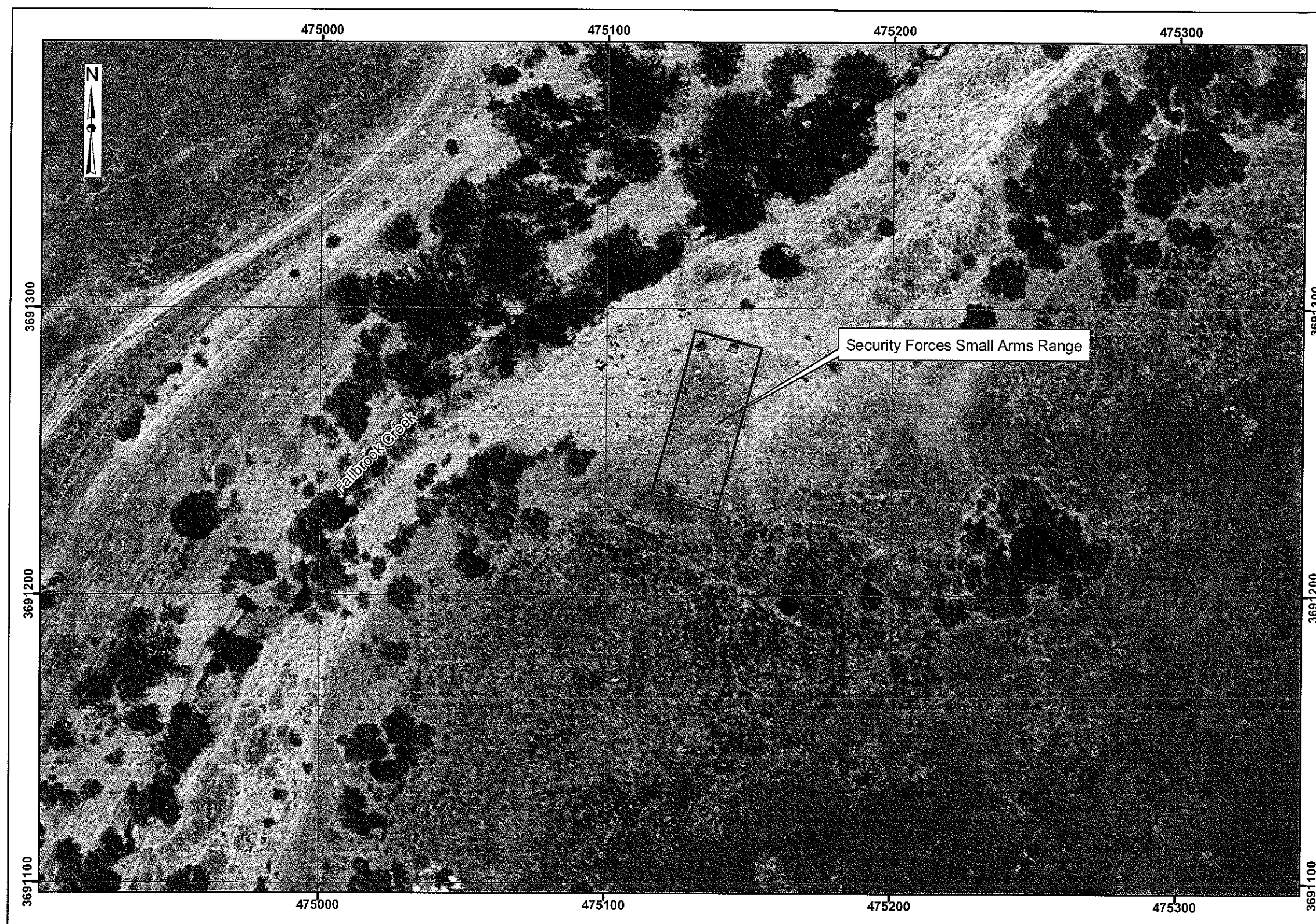
* There is no evidence of MEC presence as determined through historical documentation, interview, and visual survey. Visual observations and/or historical documentation indicate that MC may be present at the site, but MC Presence has not been confirmed by sampling or other means.

0 35 Meters

Data Source: Anteon Corporation
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
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5.2. QE Test Area

The QE Test Area covers approximately 60 acres in the southeast corner of Detachment Fallbrook, about one mile from the southern installation border. Map 2 1-1 shows the location of the site on Detachment Fallbrook and its boundaries.

5.2.1. History and Site Description

The QE Test Area (IRP Site 26) was used as a burn and disposal area beginning in 1942, and included a powder disposal area, two small round metal burn barrels, a drop test tower, and at least three burn/slit trenches (See Map 5 2-2, but not all features are still visible at the site). The drop test tower (Building 348) was used from the 1950s through the early 1980s to test bomblets from cluster bombs (such as Rockeyes) and other munitions. QE laboratory personnel used the QE Test Area as a munitions testing area from 1977 to 1989. The types of munitions tested included rifle grenades (both live and smoke), 3.5-inch rockets, 75-mm projectiles, and 60- and 81-mm mortars. The majority of the ordnance was picked up or destroyed by EOD personnel after each test. The main burn/disposal area was entirely graded in 1977 and every year thereafter to control the vegetation at the site for wildfire prevention until the site was no longer used as a range. According to personnel interviews and historical records, some parts of the QE Test Area were still used as burn/disposal pits until 1985. There were also some rocket fuel trenches on the northwestern part of the site, which were used in 1969 to bury 423 pounds of liquid rocket fuel and 142 pounds of map-4 amine fuel; however, these trenches were not visually confirmed. The area is not currently in use. The QE Test Area was originally identified under the IRP as Site 26, but is now being addressed under the MRP. Except for a geophysical survey (results not available at the time of this PA), no IRP investigations were undertaken.

The QE Test Area was oriented for firing to the southeast at targets and at a 40-foot-long steel berm. There were several concrete huts that were used for shelter, viewing platforms, and storage of the targets on the QE Test Area. The remnants of several of these concrete huts are present on the former test area. The 40-foot-long steel berm is also intact. The half-cylinder covers for two of the three burn/slit trenches remain, as do the two small round metal burn barrels and the drop test tower. The QE Test Area is located on Detachment Fallbrook, which is a fenced and guarded installation. Figure 5.2-1 shows the former range.



Figure 5.2-1: Photograph was taken during the September 2004 on-site visual survey. The white objects are concrete huts that were used for shelter, viewing platforms, and storage of the targets on the site. View is of the QE Test Area looking north.

5.2.1.1. Topography

The QE Test Area contains low hills, except for the areas that were graded to create the main test area, and the three burn/slit trenches. For further information on the topography of Detachment Fallbrook, see Section 3.2.

5.2.1.2. Geology

The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information for the QE Test Area was not available. No data from soil borings are available. Section 3.3 includes a general description of the geology of Detachment Fallbrook.

5.2.1.3. Soil and Vegetation Types

The soil at the QE Test Area is classified as a sandy loam of granitic origin and is moderately well drained. Section 3.4 includes a general description of the soil types at Detachment Fallbrook.

The vegetation in the area of the QE Test Area is considered to be mostly mixed grassland with some coastal sage scrub. Common species in mixed grassland habitat include native, perennial bunch grasses such as *Nassella* spp. mixed with nonnative annuals. Common species in coastal sage scrub habitat include coastal sagebrush (*Artemisia californica*), flat-topped buckwheat (*Eriogonum fasciculatum*), laurel sumac (*Malosma laurina*), sage (*Salvia* spp.), goldenbush (*Isocoma menziesii*), and native grasses (*Nassella* spp.). Section 3.5 includes a general description of the vegetation types at Detachment Fallbrook.

5.2.1.4. Hydrology

The QE Test Area is within both the Santa Margarita and the San Luis Rey watersheds. There are no surface water bodies in the QE Test Area. The southeastern corner of the installation, where the QE Test Area is located, drains primarily into Pilgrim Creek, which flows through MCB Camp Pendleton and the City of Oceanside before joining the San Luis River. The flow in Pilgrim Creek is highest during the summer months, due to runoff from agricultural activities upstream. Section 3.6 includes a general description of the hydrology at Detachment Fallbrook.

5.2.1.5. Hydrogeology

No site-specific groundwater depth data were available. Section 3.7 includes a general description of the hydrogeology at Detachment Fallbrook.

5.2.1.6. Cultural and Natural Resources

The data collection team for the QE Test Area found no documentation of significant cultural resources at the former test area, but there are two bedrock milling sites nearby. To preserve the integrity of the cultural resource, more specific information is not included in this document. Detachment Fallbrook has large areas of undisturbed land that can serve as suitable habitat to threatened and endangered species. Section 3.8 includes a general description of the cultural and natural resources at Detachment Fallbrook.

5.2.1.7. Endangered and Special Status Species

Threatened and endangered species data for Detachment Fallbrook are presented in Section 3.9. According to the California Wildlife and Habitat Analysis Branch, threatened and endangered species associated with the critical habitats of the former test area that are known or have been documented within or adjacent to the Detachment Fallbrook are the coastal California gnatcatcher, Least Bell's vireo, and Stephens' kangaroo rat.

5.2.2. Visual Survey Observations and Results

The data collection team conducted a visual survey of the QE Test Area on September 2004. Present during the visual survey were Mr. Chip Poalinelli, Mr. Al Larkins, and Mr. Scott Lehman, and installation representatives (Ms. Pei-Fen Tamashiro, Mr. Robbie Knight, and Mr. Si Le). The field team conducted the visual survey by walking the perimeter of the entire range, then walking several transects of it. The following munitions were observed during Malcolm Pirnie's site visit: 40-mm cartridges fired from grenade launchers, several pyrotechnic items, and several impulse cartridges. Several blasting caps, igniters, and small arms ammunition were observed in the two small round metal burn barrels still at the former test area, shown in Figure 5.2-4. The remnants of several concrete huts that were used for shelter, viewing platforms, and storage of the targets are still present on the former test area. The 40-foot-long steel berm is also intact. Figure 5.2-2 is a photo taken of one of the three burn/slit trenches on the QE Test Area. The site reconnaissance path is shown on Map 5.2-1, at the end of Section 5.2. Additional range details are illustrated on Map 5.2-2, also located at the end of Section 5.2.



Figure 5.2-2: Photograph was taken during the September 2004 on-site visual survey. View is of one of the three burn/slit trenches on the QE Test Area.

5.2.3. Munitions and Munitions Related Materials Associated with the Site

This section describes the munitions or munitions related materials, including the types and estimated maximum penetration depths, known or suspected to be at the former range. This

includes both MEC and non-hazardous munitions related scrap (e.g., fragments, base plates, and inert mortar fins).

The data collection team was not able to locate historical records stating what specific types and quantities of munitions were used at the QE Test Area. However, they were able to interview personnel who had worked at the QE Test Area. The personnel indicated the types of munitions they had tested on the former range. The available technical data sheets on these items are included in Appendix D. The QE Test Area was originally used as burn/disposal area, then as a testing area for the QE laboratory activities. The types of munitions tested included rifle grenades (both live and smoke), 3 5-inch rockets, 75-mm projectiles, and 60- and 81-mm mortars. The drop test tower (Building 348) was used to test bomblets from cluster bombs (such as Rockeyes) and other munitions. The majority of the ordnance was picked up or destroyed by EOD technicians after each test.

Based on the information obtained during the data collection process, the QE Test Area is not suspected to contain CWM filled munitions, electrically fuze munitions, or DU associated munitions.

5.2.4. MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence including: Known MEC Areas, Suspected MEC Areas, and Areas Not Suspected to Contain MEC to indicate that MEC is known or is suspected to be at the site. Map 5.2-3 illustrates the munitions characterization of the QE Test Area, and is provided at the end of Section 5.2. The MEC presence is discussed below.

5.2.4.1. Known MEC Areas

Based on our observations during the site walk, there are known MEC areas on the QE Test Area. The following munitions were observed during Malcolm Pirnie's site visit: 40-mm cartridges fired from grenade launchers, several impulse cartridges, and several pyrotechnic items such as flares. Several blasting caps, igniters and small arms ammunition were observed in the two small round metal burn barrels. Figure 5.2-3 is a photo showing some of the munitions observed in the burn/slit trenches at the former test area during the visual survey.



Figure 5.2-3: Photograph was taken during the September 2004 on-site visual survey. View is of munitions (a 37-mm cartridge case, a 40-mm cartridge case, and an illumination flare) found in one of the three burn/slit trenches on the QE Test Area.

5.2.4.2. Suspected MEC Areas

Based on historical use of the site, MEC may be present on the surface and subsurface of the QE Test Area. The QE Test Area was used quite extensively and since only a visual survey was conducted, there is a great possibility that MEC could reside in the subsurface.

5.2.4.3. Areas Not Suspected to Contain MEC

Based on available documents, interviews and the visual survey observations, the approximately 60 acres of the QE Test Area are known or suspected to contain MEC, pending further investigation.

5.2.5. Ordnance Penetration Estimates

The depth to which munitions penetrate below the ground surface depends on many factors, including the type of soil, the angle of impact, the size of the munitions, the velocity at impact, and site-specific environmental conditions. Over the years, the DoD has studied and modeled munitions penetration depths and has issued various guidance and technical documents on the subject. For the purposes of the PA, maximum probable penetration depths are estimated

following guidance listed in the latest draft (July 2002) of the DoD Directive on Explosives Safety issued by the DoD Explosives Safety Board [*DoD Directive 6055.9 (DoD Ammunition and Explosives Safety Standards)*] The Directive refers to *TM 5-855 1* and *NAVFAC P-1080*

The maximum probability penetration depths for the munitions of concern are approximately²:

- Rifle grenades – 0.3 feet
- 3 5-inch rockets - 1 foot
- 75-mm projectiles – 6.4 feet
- 60-mm mortars – 1.5 feet
- 81-mm mortars – 3.5 feet
- Bomblets – 2.4 feet

5.2.6. Munitions Constituents

MC associated with the use of the property as a testing and burning area could be present at the QE Test Area. Based on discussions with installation personnel, surface soil sampling has not occurred. The primary MCs are:

- Rifle grenades: 2,4,6-trinitrotoluene (TNT), royal demolition explosive, (RDX), zinc oxide smoke, hexachloroethane smoke, aluminum powder, white phosphorus, potassium chlorate, colored smoke, and pentaerythritol tetranitrate (PETN);
- 75-mm projectiles: ammonium picrate (Explosive D), ammonium nitrate, iron, and TNT;
- 60-mm and 81-mm mortars: black powder pellets, smoke mix, zinc oxide smoke, hexachloroethane smoke, aluminum powder, RDX, and TNT;
- Bomblets: octol, RDX, and TNT;
- 3 5-inch rocket: TNT, RDX, and rocket propellant;
- Pyrotechnics/blasting caps: titanium tetrachloride, white phosphorus, pyrotechnic composition, lithium hydride, magnesium, RDX, lead styphnate, lead azide, barium, and strontium; and
- Small Arms: lead, arsenic, antimony, copper, chromium, cadmium, black or smokeless powder constituents, nickel, and zinc.

Figure 5-2-4 shows some of the munitions items that were burned at the Fallbrook QE Test Area.



Figure 5.2-4: Photograph was taken during the September 2004 on-site visual survey. View is of munitions items found in one of the two small round metal burn barrels at the QE Test Area.

5.2.7. Contaminant Migration Routes

Migration of MEC and MC may occur through surface soil erosion, runoff, and wind and dust generation. Future construction, excavation, and maintenance at the site are also potential release mechanisms for MEC and MC. MC in runoff could potentially end up in surface water or sediment. MC could also potentially leach through soils or surface waters to groundwater.

5.2.8. Receptors and Pathways

Potential human receptors at the QE Test Area include Navy personnel, visitors, and private contractors. Ecological receptors may come into direct contact with MEC/MC in soil while foraging or burrowing. Ecological receptors may also come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and prey). There is a potentially complete secondary pathway for the general public, who could come into contact with any MC that flow out of the installation through the surface water system.

5.2.8.1. Nearby Populations

Fallbrook and San Diego County have populations of 29,100, and 2,813,833, respectively (U.S. Census Bureau, 2000). The Detachment Fallbrook has a workforce of Command personnel

comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. The QE Test Area is approximately 15,750 feet from the housing complex at the installation. See Section 2.1 for more information on the housing complex.

5.2.8.2. Buildings Near/Within Site

There are no occupied buildings on the QE Test Area or in its immediate vicinity. The remnants of several concrete huts that were used for shelter, viewing platforms, and storage of the targets remain on the former test area. The Town of Fallbrook is approximately 5,400 feet (ft) to the east.

5.2.8.3. Utilities On/Near Site

There are no utilities located on the site. A Fallbrook Sanitation District line is located approximately 0.5 miles to the west of the site.

5.2.9. Land Use

The QE Test Area is closed and no longer in use. Due to the proximity of the site to some of the installation's munitions storage bunkers, the site of the former test area has ESQD Arcs restrictions. No future land use change is planned.

5.2.10. Access Controls / Restrictions

The QE Test Area is located on Detachment Fallbrook, which is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order, and for implementing access control policies and procedures. The QE Test Area is also located within a restricted area guarded by the security force.

5.2.11. Conceptual Site Model

This CSM was developed following guidance documents issued by the USEPA for hazardous waste sites and the USACE for OE sites. Guidance documents included the USEPA's Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA/540/G-89/004) and the Final USACE CSM Guidance Development of Integrated Conceptual Site Models for Environmental OE Sites (USACE, 2003).

FINAL PRELIMINARY ASSESSMENT

The CSM describes the site and its environmental setting. The CSM presents information regarding: 1) MEC and/or MC known or suspected to be at the site; 2) current and future reasonably anticipated or proposed uses of the real property; and 3) actual, potentially complete, or incomplete exposure pathways that link MEC and/or MC to receptors.

The CSM is presented in a series of information profiles that provide information about the site. The information profiles are included in Table 5.2-1 below.

Table 5.2-1: Conceptual Site Model Information Profiles –QE Test Area		
Profile Type	Information Needs	Preliminary Assessment Findings
Range Profile	Installation Name	Detachment Fallbrook
	Installation Location	Detachment Fallbrook is located 53 miles north of San Diego in northern San Diego County, CA
	Range Name	QE Test Area
	Range Location	The QE Test Area is located in the southeastern corner of the installation, about one mile from the southern installation border.
	Range History	The QE Test Area was originally used as a burn/disposal area starting in 1942. There was a powder disposal area on the northern part of the test area, two small round metal burn barrels, a drop test tower, and at least three burn/slit trenches. The drop test tower (Building 348) was used from the 1950s through the early 1980s to test bomblets from cluster bombs (such as Rockeye’s), and other munitions. QE Laboratory personnel used it as a munitions testing area from 1977 to 1989 because it was already being used for other ordnance activities. The main burn/disposal area, including the thermally-treated ordnance items, was entirely graded in 1977. Certain parts of the test area were still used as burn/disposal areas until 1985, according to personnel interviews and historical records. There were also some rocket fuel trenches on the northwestern part of the QE Test Area, which were used in 1969 to bury 423 pounds of liquid rocket fuel and 142 pounds of map-4 amine fuel.

Table 5.2-1: Conceptual Site Model Information Profiles –QE Test Area		
Profile Type	Information Needs	Preliminary Assessment Findings
	Range Area and Layout	The QE Test Area occupies approximately 60 acres. The personnel test fired at targets or at a 40-ft-long steel berm. The test area was oriented for firing towards the southeast. There was also a powder disposal area on the northern part of the test area, two small round metal burn barrels, a drop test tower, and at least three burn/slit trenches. There are also some rocket fuel trenches on the northwestern part of the site. There were several concrete huts that were used for shelter, viewing platforms, and storage of the targets on the QE Test Area.
	Range Structures	The remnants of several concrete huts that were used for shelter, viewing platforms, and storage of the targets remain on the former test area. The 40-ft-long steel berm is also intact on the site. The half-cylinder covers for two of the three burn/slit trenches remain on the site, as are the two small round metal burn barrels and the drop test tower.
	Range Boundaries	Map 2 1-1 shows the location of the QE Test Area. Grassland with coastal sage scrub extends north to the Missile Maintenance Test Facility, which is approximately 1,800 ft away. Grassland with coastal sage scrub extends east, west, and south to the installation boundaries. The city of Fallbrook is approximately 5,400 ft. to the east.
	Range Security	The QE Test Area is located on Detachment Fallbrook, which is a fenced and guarded installation. The QE Test Area is also located within a restricted area guarded by the security force.
	Munitions Types	The QE Test Area was originally used as burn/disposal area, then as a testing area for the QE Laboratory activities. The types of munitions tested included rifle grenades (both live and smoke), 3 5-in rockets, 75-mm shells, and 60- and 81-mm mortars. The drop test tower (Building 348) was used to test bomblets from cluster bombs (such as Rockeyes) and other munitions. The majority of the ordnance was picked up or destroyed by EOD after each test.
Munitions/ Release Profile		

Table 5.2-1: Conceptual Site Model Information Profiles –QE Test Area

Profile Type	Information Needs	Preliminary Assessment Findings
	Maximum Probability Penetration Depth	The maximum probability penetration depths for the munitions of concern are approximately: Rifle grenades – 0.3 ft 3.5-in rockets - 1 ft 75-mm shells – 6.4 ft 60-mm mortars – 1.5 ft 81-mm mortars – 3.5 ft Bomblets – 2.4 ft
	MEC Density	The QE Test Area is a known MEC area. The site has a medium MEC density.
	MEC Scrap/Fragments	The following munitions were observed during Malcolm Pirnie's site visit: 40-mm cartridges fired from grenade launchers, several impulse cartridges, and several pyrotechnic items such as flares. Several blasting caps, igniters and small arms ammunition were observed in the two small round metal burn barrels.
	Associated Munitions Constituents	The primary MC of concern are: <ul style="list-style-type: none"> o Rifle grenades: TNT, RDX, zinc oxide smoke, hexachloroethane smoke, aluminum powder, white phosphorus, potassium chlorate, colored smoke, and PETN; o 75-mm projectiles: ammonium picrate (Explosive D), ammonium nitrate, iron, and TNT; o 60-mm and 81-mm mortars: black powder pellets, smoke mix, zinc oxide smoke, hexachloroethane smoke, aluminum powder, RDX, and TNT; o Bomblets: octol, RDX, and TNT; o 3.5-in rocket: TNT, RDX, and rocket propellant; o Pyrotechnics/blasting caps: titanium tetrachloride, white phosphorus, pyrotechnic composition, lithium hydride, magnesium, RDX, lead styphnate, lead azide, barium, and strontium; and o Small Arms: lead, arsenic, antimony, copper, chromium, cadmium, black or smokeless powder constituents, nickel, and zinc.
	Migration Routes/Release Mechanisms	Migration of MEC and MC may occur through surface soil erosion, runoff, and wind and dust generation. Future construction, excavation, and maintenance at the QE Test Area are also potential release mechanisms. MC in runoff could potentially end up in surface water or sediment. MC could also potentially leach through soils or surface waters to groundwater.

Table 5.2-1: Conceptual Site Model Information Profiles –QE Test Area

Profile Type	Information Needs	Preliminary Assessment Findings
Physical Profile	Climate	The climate at Detachment Fallbrook is typical of the prevailing coastal southern California Mediterranean climate and is characterized by mild winters, cool summers, and infrequent rainfall. The annual average temperature is 63 °F. Precipitation ranges from 13.7 to 17.1 inches per year, with January being the wettest month and July the driest. Summers at the installation are punctuated by the Santa Ana (offshore) winds.
	Topography	The QE Test Area contains low hills, except for the areas that were graded to create the main test area and the burial trenches.
	Geology	The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information was not available.
	Soil	The soil at the QE Test Area is classified as a sandy loam of granitic origin. Soils at the former test area are moderately well drained.
	Hydrogeology	No site-specific groundwater depth data were available.
	Hydrology	The QE Test Area is within both the Santa Margarita and the San Luis Rey watersheds. There are no surface water bodies in the QE Test Area. The southeastern corner of the installation, where the QE Test Area is located, drains primarily into Pilgrim Creek, which flows through MCB Camp Pendleton and the City of Oceanside before joining the San Luis River.
	Vegetation	The vegetation in the area of the QE Test Area is considered to be mostly mixed grassland with some coastal sage scrub.
Land Use and Exposure Profile	Current Land Use	The QE Test Area is closed and is no longer in use.
	Current Human Receptors	Navy personnel and Navy-permitted visitors (including contractors). There is also a potentially complete exposure pathway for the general public coming into contact with MC migrating off the installation through the surface water system.
	Current Activities (frequency, nature of activity)	Activities at the range may include environmental and ecological surveys.
	Potential Future Land Use	The former QE Test Area was closed in 1989 because the QE Laboratory no longer needed the site as a testing area. There is no land use change planned.

Table 5.2-1: Conceptual Site Model Information Profiles –QE Test Area

Profile Type	Information Needs	Preliminary Assessment Findings
	Potential Future Human Receptors	Navy personnel and Navy-permitted visitors (including contractors). There is also a potentially complete exposure pathway for the general public coming into contact with MC migrating off the installation through the surface water system
	Potential Future Land Use-Related Activities:	Any potential future land use activities would have to follow any Navy ESQD Arc waivers or exemptions. Other potential future activities at the range include environmental and ecological surveys.
	Zoning/Land Use Restrictions	Due to the proximity of the site to some of the installation's munitions storage bunkers, the site of the former test area has ESQD Arc restrictions. The site is also listed as habitat for the Stephens' kangaroo rat, which is a federally protected species.
	Demographics/Zoning	The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. Demographic data include the following: <ul style="list-style-type: none">Town of Fallbrook: Population (U.S. Census, 2000): 29,100San Diego County: Population (U.S. Census, 2000): 2,813,833
	Beneficial Resources	The coastal sage scrub and mixed grasslands habitats offer roosting and foraging resources for raptors.
Ecological Profile	Habitat Type	The QE Test Area contains mixed grasslands and some coastal sage scrub habitat. The former test area is also in a zone designated as habitat for the federally endangered Stephens' kangaroo rat.
	Degree of Disturbance	The area was graded before its closure in 1989. There are also at least three burial slits/trenches (about 10-15 ft in depth) throughout the site. Current and anticipated future activities at the range, such as environmental and ecological surveys, may disturb habitat and/or ecological receptors known or potentially present within range areas.
	Ecological Receptors	
	General:	Common fauna include mammals (mountain lions, bats, opossums, coyotes, foxes, skunks, deer, rats, rabbits, and mice), reptiles (lizards, toads, turtles, and rattlesnakes), insects (beetles and butterflies), amphibians (toads, frogs, and salamanders), and birds (owls, swallows, wrens, hawks, vultures, herons, and ducks).

Table 5.2-1: Conceptual Site Model Information Profiles –QE Test Area

Profile Type	Information Needs	Preliminary Assessment Findings
	Federal Endangered Species:	Stephens' kangaroo rat and Least Bell's vireo
	Federal Threatened Species:	Coastal California gnatcatcher
	State Endangered Species:	Least Bell's vireo
	State Threatened Species:	Stephens' kangaroo rat
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	Potential human receptors at the QE Test Area include Navy personnel, visitors, and private contractors. Ecological receptors may come into direct contact with MEC/MC in soil while foraging or burrowing. Ecological receptors may also come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and prey). There is also a potentially complete exposure pathway for the general public coming into contact with MC migrating off the installation through the surface water system

A key element of the CSM is the exposure pathway analysis, which is performed separately for MEC and for MC.

For MEC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MEC are expected to be found); 2) access (e.g., controlled or uncontrolled access, items on the surface or within the subsurface); 3) an activity (e.g., non-intrusive grounds maintenance or intrusive construction); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, authorized visitors, or ecological receptors). It is important to recognize that environmental mechanisms (e.g., erosion) and/or human intervention may result in the repositioning of MEC.

For MC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MC are expected to be found); 2) an exposure medium (e.g., surface soil); 3) an exposure route (e.g., dermal contact); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, authorized visitors, or ecological receptors). If the point of exposure is not at the same location as the source, the pathway may also include a release mechanism (e.g., volatilization) and a transport medium (e.g., air).

The potential interactions between the source and receptors are assessed differently between MEC and MC. For MC, interaction between the source and receptors involves a release mechanism for the MC, an exposure medium that contains the MC, and an exposure route that places the receptor into contact with the contaminated medium. For MEC, interaction between the potential receptors and an MEC source has two components. The receptor must have access to the source and must engage in some activity that results in contact with individual MEC items within the source area.

MEC Interactions and Pathway Analysis

The pathway analysis for MEC is shown in Figure 5.2-5 because the QE Test Area is known to contain MEC. Historical and visual evidence indicate that MEC are present at the QE Test Area. MEC was observed on the surface and is likely to be present in the subsurface at the site. The release mechanism of handling/treading underfoot activities creates a complete pathway for all human receptors, and biota for MEC on the surface of the site. The release mechanism of intrusive activities (such as digging or drilling) creates a potentially complete pathway for Navy personnel, contractors and biota both for MEC on the surface (0-2 feet) and subsurface at the site.

MC Interactions and Pathway Analysis

The pathway analysis for MC is shown in Figure 5 2-6. Potential receptors include both human (Navy personnel, and contractor/visitor) and ecological receptors (biota) that may come in contact with MC in the source medium or other potentially contaminated media. Pathways are shown for each medium and are discussed below. For MC, interaction between the source (e.g., the backstop berm) and receptors generally involves a release mechanism for the MC (e.g., uptake into the food chain, runoff to surface water), an exposure medium containing the MC (e.g., soil, sediment), and an exposure route (e.g., incidental ingestion, dermal contact, inhalation) that places the receptor into contact with the contaminated medium.

Surface Water/Sediment

As discussed earlier, there are no surface water bodies at the QE Test Area. However, surface water can accumulate on the surface of certain parts of the site during the rainy season, so MC could become available to receptors in surface water or sediment. The pathway for surface water and/or sediment is considered potentially complete at the former QE Test Area. There is a potentially complete pathway for the general public for MC that flows out of the installation through the surface water system.

Plant/Animal Uptake

Potentially complete pathways are indicated for biota (wildlife) exposed to MC at the QE Test Area via the food chain. MC may be taken up by plants and prey and consumed by animals at the former test area.

Surface Soil

Potentially complete pathways exist for all receptors (except for the general public) via all exposure routes for surface soil contaminated with MC at the QE Test Area. It is possible that MC remains in the surface soil (i.e., 0 to 2 feet below ground surface). Inhalation exposures to humans or biota from inhalation of dust are anticipated due to the low vegetative cover on the existing soils. Any future movement or grading of surface soils could make MC available for wind distribution and subsequent inhalation.

Subsurface Soil

The potential for subsurface soil impacts is considered to be potentially complete for biota and for Navy personnel and contractors. Biota might come into contact with the contaminated soil by burrowing and/or ingesting. Navy personnel and contractors might engage in excavation or drilling activities.

Groundwater

Potentially complete pathways for Navy personnel and contractors/visitors are indicated for groundwater contaminated with MC at the QE Test Area. Navy personnel and contractors/visitors may come into contact with groundwater during environmental investigations (i.e., monitoring well installation and sampling) at the former range. The potential for groundwater impacts is considered to be incomplete for all other receptors.

An exposure pathway does not exist for MC volatilizing into the air for all receptors.

5.2.12. Summary

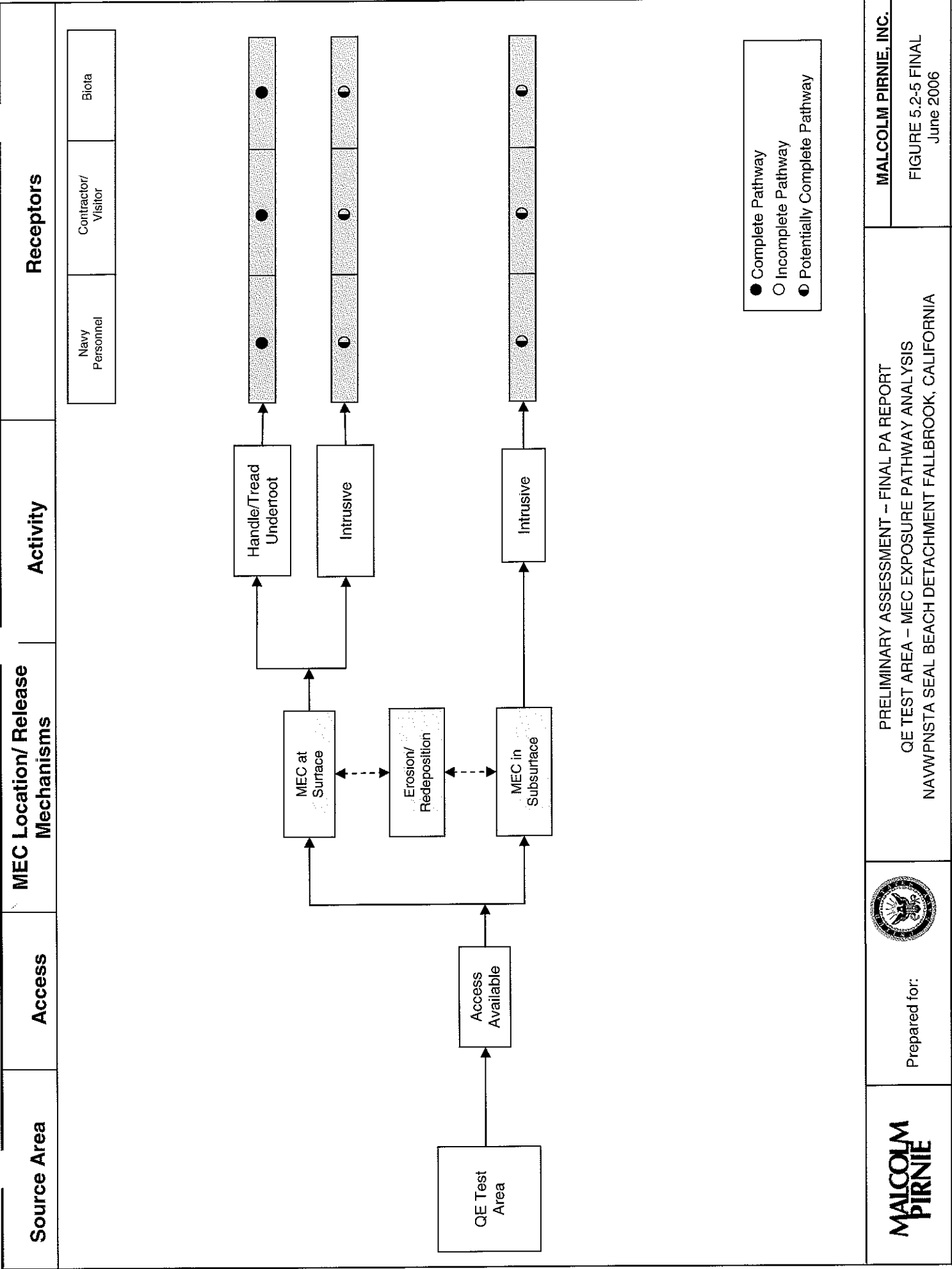
The 60-acre QE Test Area (IRP Site 26) is located in the southeast corner of Detachment Fallbrook, about one mile from the southern installation border. The QE Test Area was used as a burn/disposal area beginning in 1942, and included a powder disposal area, two small round metal burn barrels, a drop test tower, and at least three burn/slit trenches (not all features are currently visible at the site). The drop test tower (Building 348) was used from the 1950s through

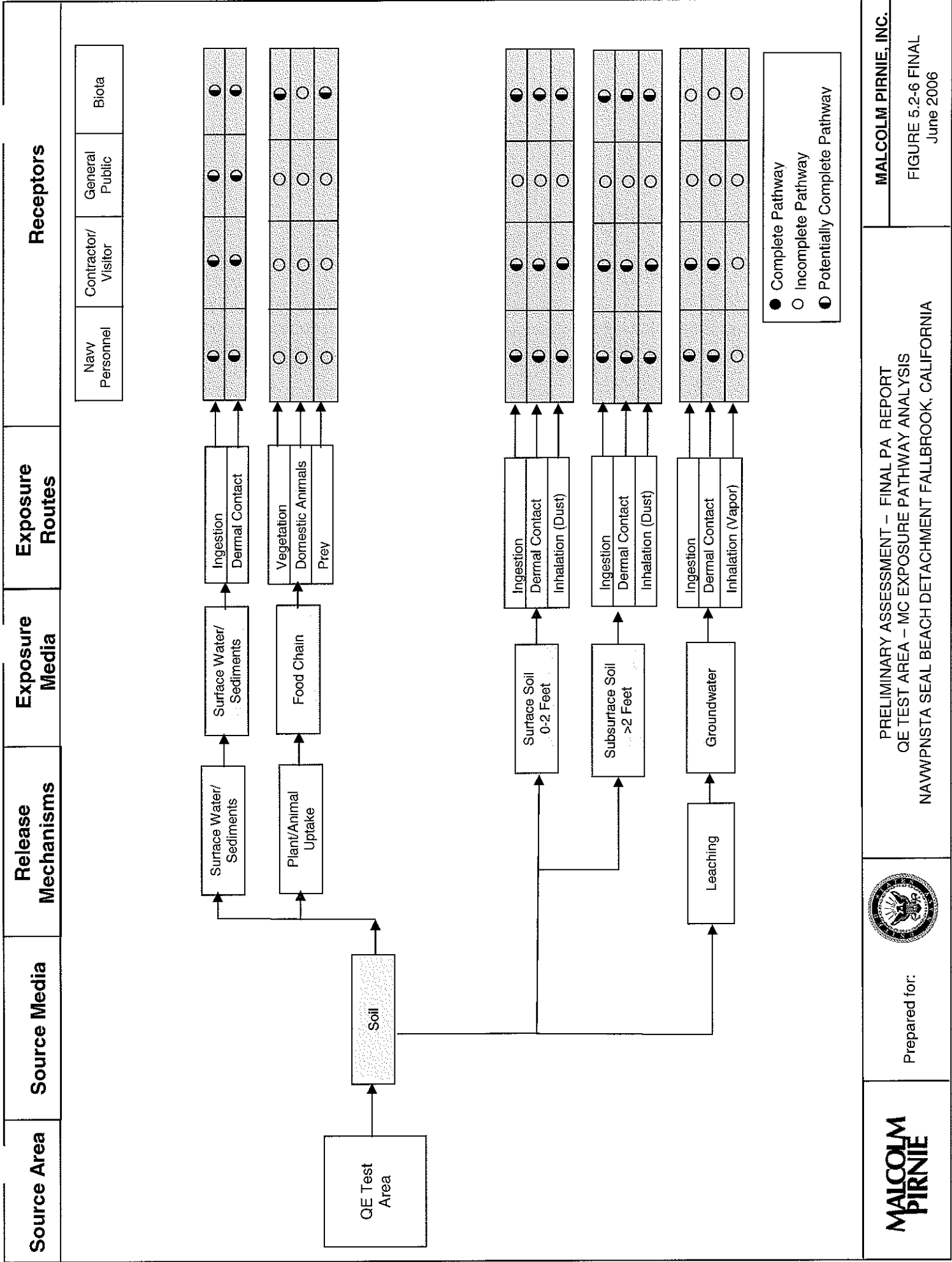
FINAL PRELIMINARY ASSESSMENT

the early 1980s to test bomblets from cluster bombs (such as Rockeyes) and other munitions. QE laboratory personnel used the QE Test Area as a munitions testing area from 1977 to 1989. The types of munitions tested included rifle grenades (both live and smoke), 3.5-inch rockets, 75-mm projectiles, and 60- and 81-mm mortars. The majority of the ordnance was picked up or destroyed by EOD personnel after each test. The main burn/disposal area was entirely graded in 1977. According to personnel interviews and historical records, some parts of the QE Test Area were still used as burn/disposal areas until 1985. There were also some rocket fuel trenches on the northwestern part of the site, which were used in 1969 to bury 423 pounds of liquid rocket fuel and 142 pounds of map-4 amine fuel. The area is not currently in use.

5.2.13. Recommendations

Based on the data collected and presented in this PA, an SI is recommended for both MEC and MC at the QE Test Area. The SI activities should focus on determining the extent of MEC and MC at the site. During the SI, it is recommended that surface and subsurface soil samples be collected from the site and analyzed for ordnance residuals and metals. It is also recommended that groundwater monitoring wells be installed to verify that the groundwater under the site has not been affected. If intrusive activities are planned for the site, the potential receptors should be made aware that the site was a munitions burial site.





Prepared for:



PRELIMINARY ASSESSMENT – FINAL PA REPORT
QE TEST AREA – MC EXPOSURE PATHWAY ANALYSIS
NAVWPNSTA SEAL BEACH DETACHMENT FALLBROOK, CALIFORNIA

MALCOLM PIRNIE, INC.

FIGURE 5.2-6 FINAL
June 2006



Preliminary Assessment
NAWPNSTA Seal Beach
Detachment Fallbrook, California

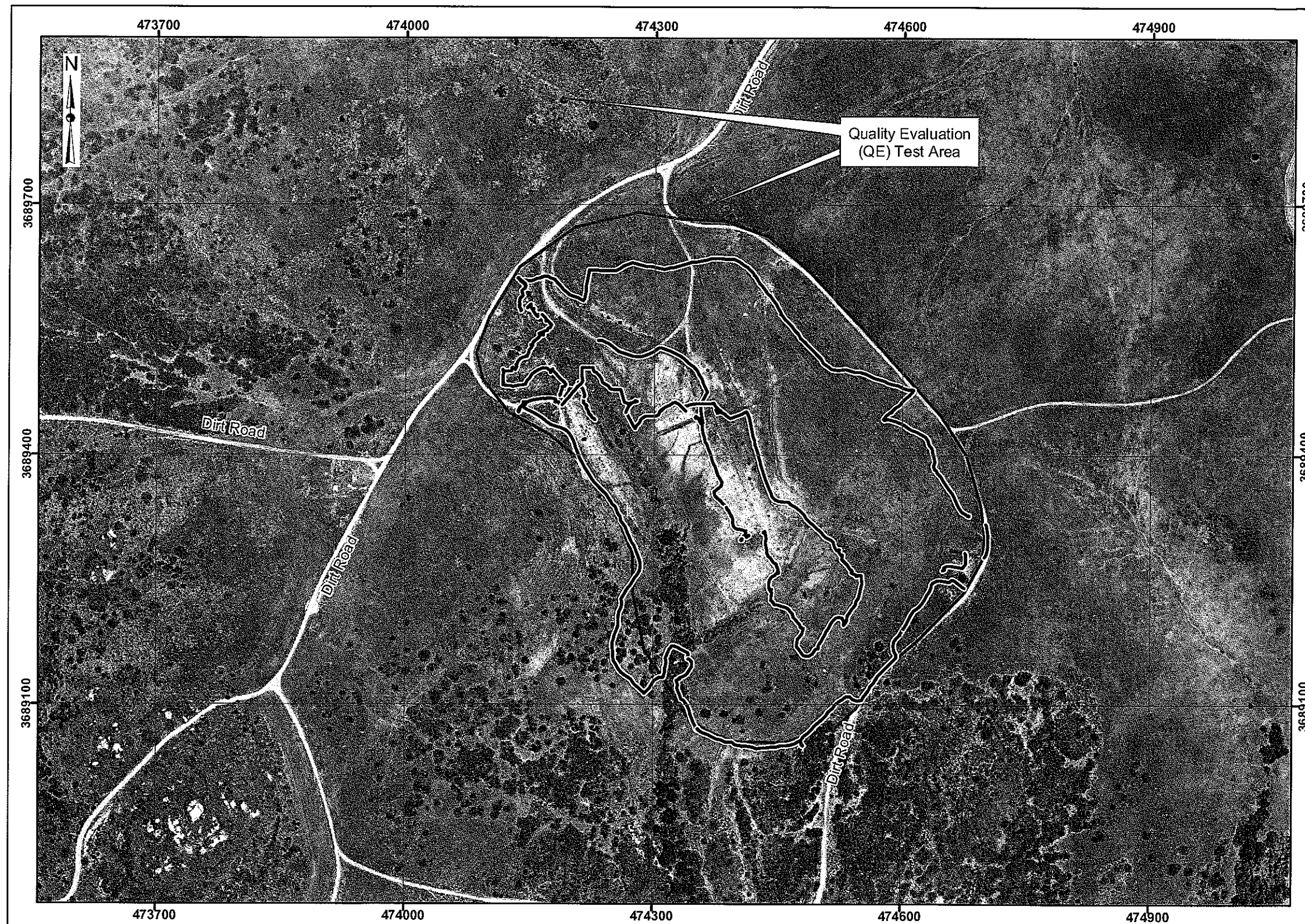


MALCOLM
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Map 5.2-1
Visual Survey
Quality Evaluation
(QE) Test Area (IRP Site 26)

Legend

-  Quality Evaluation
(QE) Test Area
-  Site Reconnaissance Path



0 150 Meters

Data Source: Anteon Corporation,
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006

Preliminary Assessment
NAWPNSTA Seal Beach
Detachment Fallbrook, California



MALCOLM
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Map 5.2-2
Site Details
Quality Evaluation
(QE) Test Area (IRP Site 26)

Legend

- Quality Evaluation (QE) Test Area
- Target Area
- Topographic Contours (ft above MSL)
- Streams

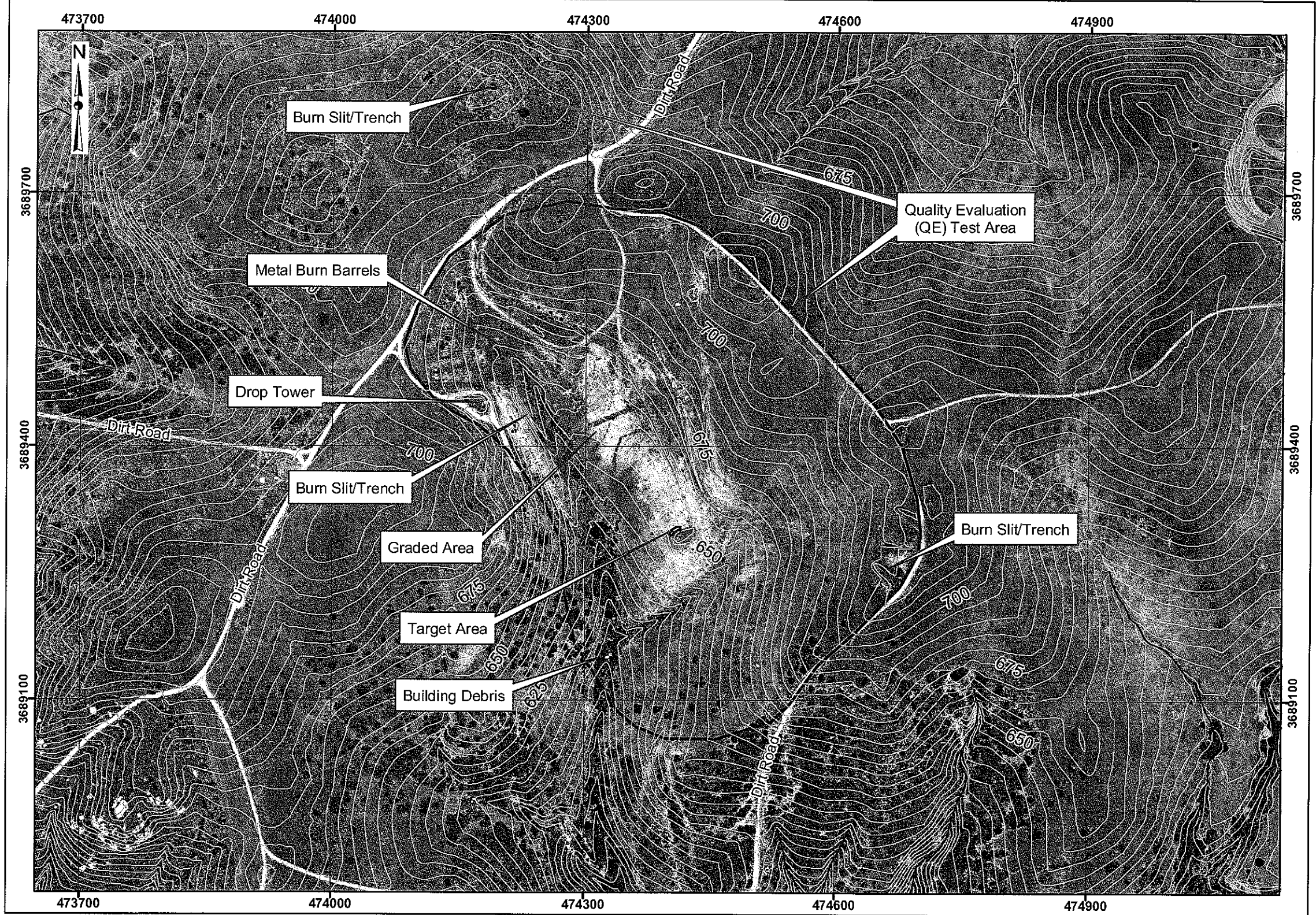
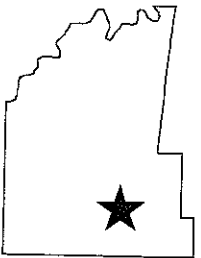
0 150 Meters

Data Source: Anteon Corporation,
Orthophoto, June 3, 2004
NAWPNSTA Seal Beach GIS data,
Vector Data, 2005

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006

NAWPNSTA Seal Beach
Detachment Fallbrook, California
Quality Evaluation (QE) Test Area



Preliminary Assessment
NAWPNSTA Seal Beach
Detachment Fallbrook, California



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Map 5.2-3
Munitions Characterization
Quality Evaluation
(QE) Test Area (IRP Site 26)

Legend

- Quality Evaluation (QE) Test Area
- MEC Sighting
- Evidence of Munitions Use

MEC Presence*

- Known
- Suspect

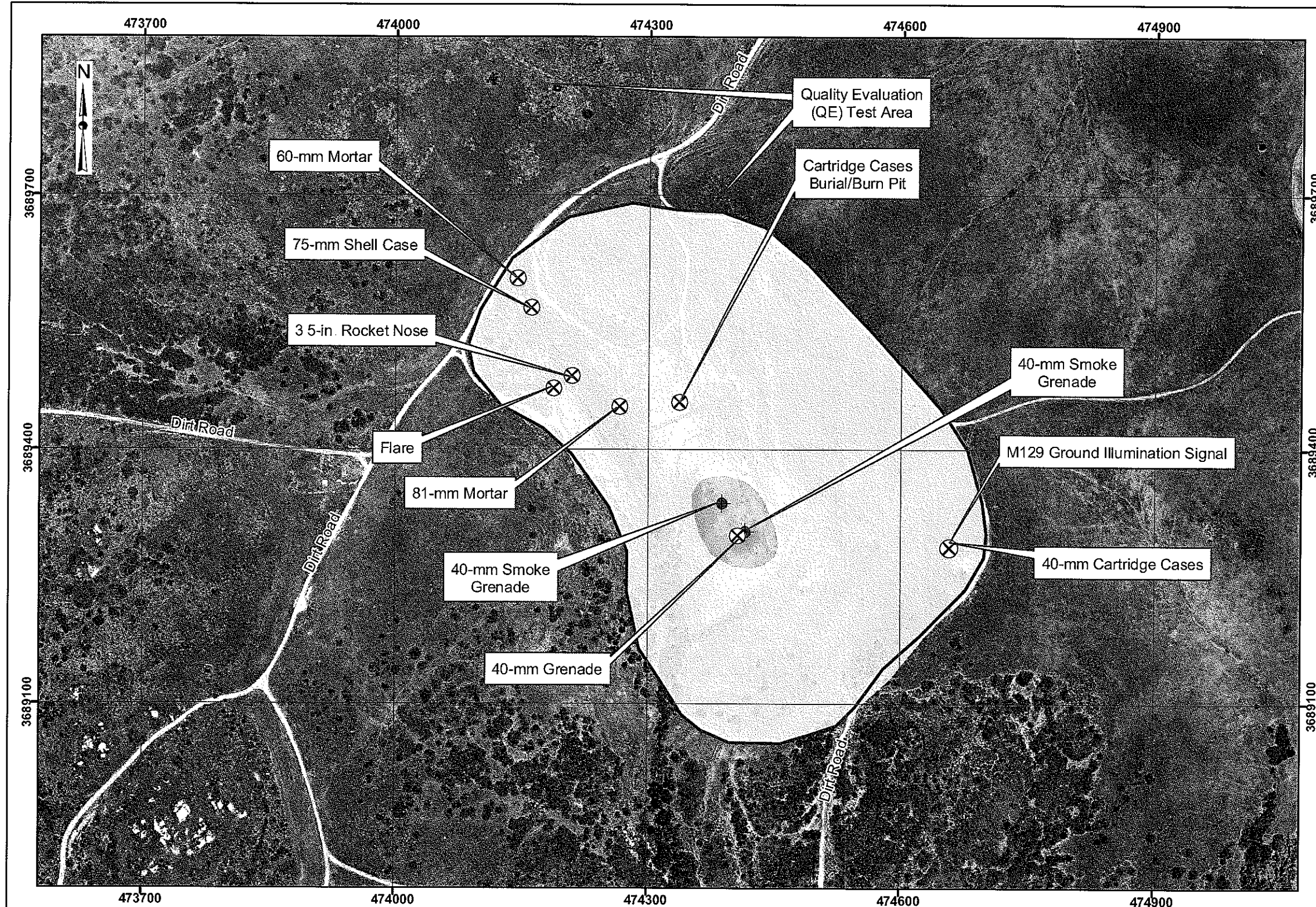
* MEC Presence was determined through review of historical documentation, interviews, and visual survey.

0 150 Meters

Data Source: Anteon Corporation,
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006



5.3. Salvage Yard Landfill

The Salvage Yard Landfill covers approximately 13 acres in the northeast corner of the installation, approximately 1,000 feet from the western corner of the housing complex at the installation. Map 2 1-1 shows the location of the site on Detachment Fallbrook and its boundaries.

5.3.1. History and Site Description

The Salvage Yard Landfill (IRP Site 33) was a burial area for munitions and dunnage, according to personnel interviews, historical records, and recent visual surveys. On historical maps, the area is labeled as a storage yard starting in the 1950s and ending in the late 1960s. It was also used as a disposal area during this time. Historical records indicate that expended cartridges, primers, live projectiles, and inert anti-tank projectiles were buried in the area. An EOD report from February 2002 describes an incident in which EOD technicians from MCB Camp Pendleton were called to the site to handle some suspected 20-mm and 40-mm rounds that were found on the ground surface, as well as some blasting caps. The area is not currently in use. The area is not completely fenced. Figure 5.3-1 shows a view of the former landfill. The Salvage Yard Landfill was originally identified under the IRP, but is now being addressed under the MRP. No IRP investigations were undertaken.



Figure 5.3-1: View is of the Salvage Yard Landfill during the September 2004 on-site visual survey.

5.3.1.1. Topography

The Salvage Yard Landfill contains low hills and natural ravines. For further information on the topography of Detachment Fallbrook, see Section 3.2.

5.3.1.2. Geology

The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information for the Salvage Yard Landfill was not available. Section 3.3 includes a general description of the geology of Detachment Fallbrook.

5.3.1.3. Soil and Vegetation Types

Soils in the Salvage Yard Landfill are classified as a sandy loam of granitic origin and are moderately well drained. Section 3.4 includes a general description of the soil types at Detachment Fallbrook.

The vegetation in the area of the Salvage Yard Landfill is considered to be mostly of the coastal sage scrub classification with some mixed grasslands. Species common in coastal sage scrub habitat include coastal sagebrush (*Artemisia californica*), flat-topped buckwheat (*Erigonum fasciculatum*), laurel sumac (*Malosma laurina*), sage (*Salvia* spp.), goldenbush (*Isocoma menziesii*), and native grasses (*Nassella* spp.). Species common in mixed grasslands habitat include native, perennial bunch grasses such as *Nassella* spp. mixed with non-native annuals. Section 3.5 includes a general description of the vegetation types at Detachment Fallbrook.

5.3.1.4. Hydrology

The Salvage Yard Landfill is within the Santa Margarita watershed. There are no permanent surface water bodies in the Salvage Yard Landfill, but there is an intermittent stream that drains to the Santa Margarita River on the northern boundary of the landfill. Section 3.6 includes a general description of the hydrology at Detachment Fallbrook.

5.3.1.5. Hydrogeology

No site-specific groundwater depth information was available for the Salvage Yard Landfill. Section 3.7 includes a general description of the hydrogeology at Detachment Fallbrook.

5.3.1.6. Cultural and Natural Resources

The data collection team for the Salvage Yard Landfill found documentation of cultural resources at and near the site. The cultural resources consist of six prehistoric sites, one milling site, and one 1930's cattle trough. To preserve the integrity of the cultural resources, more specific information is not included in this document. Detachment Fallbrook has large areas of undisturbed land that can serve as suitable habitat to threatened and endangered species. Section 3.8 includes a general description of the cultural and natural resources at Detachment Fallbrook.

5.3.1.7. Endangered and Special Status Species

Threatened and endangered species data for Detachment Fallbrook are presented in Section 3.9. According to the California Wildlife and Habitat Analysis Branch, threatened and endangered species associated with the critical habitats of the former range that are known or have been documented within or adjacent to the Detachment Fallbrook are the Stephens' kangaroo rat, Least Bell's vireo, and the coastal California gnatcatcher.

5.3.2. Visual Survey Observations and Results

The data collection team conducted two visual surveys of the Salvage Yard Landfill: one on September 28, 2004 and one on March 10, 2005. During the visual surveys, the following Malcolm Pirnie team members were present: Mr. Chip Poalinelli, Mr. Al Larkins (September 2004), Mr. Dan Hains (March 2005), and Mr. Scott Lehman. The following Navy representatives were present during the September 2004 visual survey: Ms. Pei-Fen Tamashiro, Mr. Robbie Knight, and Mr. Si Le. The field team conducted the visual surveys by walking the perimeter of the entire site, then walking several transects of it. The following munitions were observed during the visual surveys: a 25-pound bomb, a 3-pound pyrotechnic bomb, an MK 76 practice bomb, a 2 36-inch anti-tank HE rocket, a 5-pound practice bomb, 20-mm rounds, other projectiles, several smokeless powder cans and lids, and other munitions scrap. Figure 5.3-3 is a photo taken during the March visual survey, showing a retaining wall of the landfill with exposed munitions. The site reconnaissance path is shown on Map 5.3-1 located at the end of Section 5.3. Additional site details are illustrated on Map 5.3-2 also located at the end of Section 5.3.

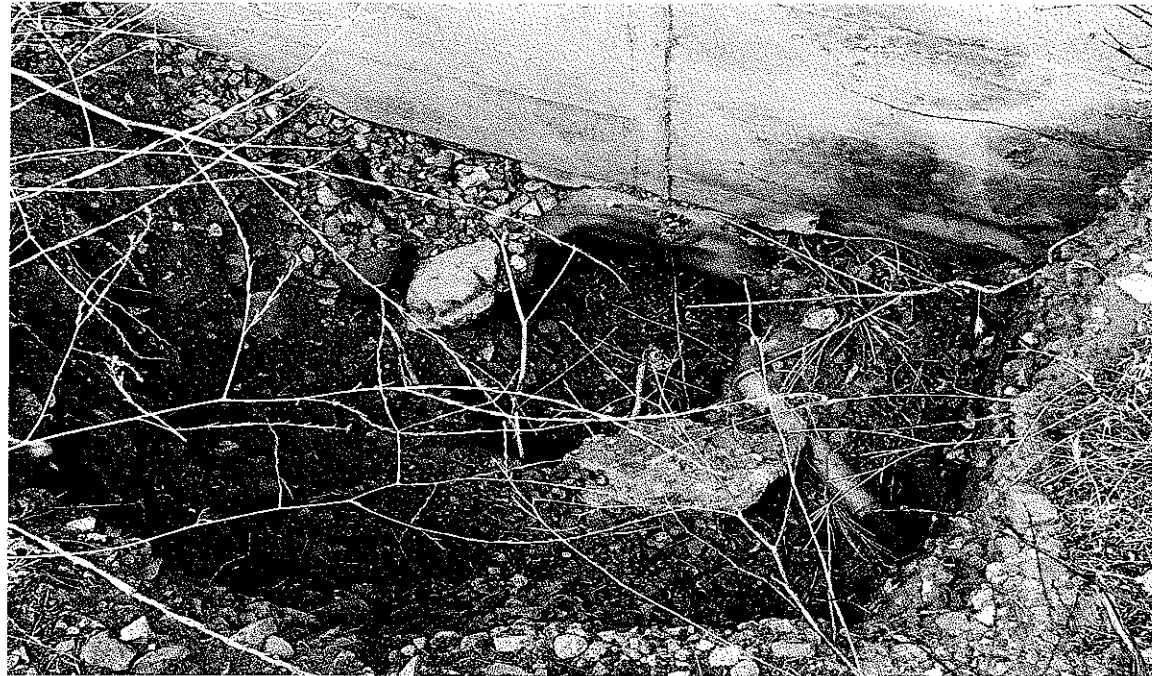


Figure 5.3-2: View is of the exposed suspected MEC along the retaining wall at the Salvage Yard Landfill. Photograph was taken during the September 2004 visual survey.



Figure 5.3-3: View of a retaining wall of the landfill with exposed munitions. Photograph was taken during the March 2005 visual survey.

5.3.3. Munitions and Munitions Related Materials Associated with the Site

This section describes the munitions or munitions related materials, including the types and estimated maximum penetration depths, known or suspected to be at the former landfill. This includes both MEC and non-hazardous munitions related scrap (e.g., fragments, base plates, and inert mortar fins).

The data collection team was able to determine the types of munitions suspected to be buried at the Salvage Yard Landfill from the personnel interviews, the February 2002 EOD report, and the visual surveys. The available technical data sheets on these items are included in Appendix D. The site was used as a burial area for munitions and dunnage. The munitions buried included expended cartridges, primers, live projectiles, and inert anti-tank projectiles. Suspected 20-mm and 40-mm rounds, and blasting caps have been found on the ground surface.

Based on the information obtained during the data collection process, the Salvage Yard Landfill is not suspected to contain CWM filled munitions, electrically fused munitions, or DU associated munitions.

5.3.4. MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence including: Known MEC Areas, Suspected MEC Areas, and Areas Not Suspected to Contain MEC to indicate that MEC is known or is suspected to be at the site. Map 5-3-3 illustrates the munitions characterization of the Salvage Yard Landfill, and is provided at the end of Section 5.3. The MEC presence is discussed below.

5.3.4.1. Known MEC Areas

The Salvage Yard Landfill has Known MEC Areas. The following MEC were observed during the visual surveys: a 25-pound bomb, a 3-pound pyrotechnic bomb, a 2.36-inch anti-tank HE rocket, 20-mm rounds, other projectiles, and other munitions scrap.

5.3.4.2. Suspected MEC Areas

Based on historical use of the site, MEC may be present on the surface and subsurface of the Salvage Yard Landfill. The Salvage Yard Landfill was used to bury MEC items and since only a visual survey was conducted, there is a possibility that MEC could reside in the subsurface.

5.3.4.3. Areas Not Suspected to Contain MEC

Based upon observations made and data collected during the PA process, some areas of the Salvage Yard Landfill may not contain MEC depending on disposal practices

5.3.5. Ordnance Penetration Estimates

Munitions below ground surface at the Salvage Yard Landfill were emplaced by burial, not penetration. The depth at which munitions might be buried is unknown.

5.3.6. Munitions Constituents

MC associated with expended cartridges, primers, live projectiles, and inert anti-tank projectiles could be present at the Salvage Yard Landfill. The primary MC based on personal interview, document reviews, and site visits are plastic-based explosives (PBX), RDX, fluoroelastomers, zirconium pellets, and HMX from 20-mm and 40-mm projectiles; titanium tetrachloride, red phosphorus, and smoke mixture, from 25-pound bombs, potassium perchlorate, powdered aluminum, black powder, smoke mixture, and lead from 3-pound pyrotechnic bombs; TNT and PETN from 2.36-inch anti-tank HE rocket; smokeless powder from smokeless powder cans; titanium tetrachloride, white phosphorous, pyrotechnic composition, lithium hydride, magnesium, RDX, lead styphnate, lead azide, barium, and strontium from pyrotechnics/blasting caps; and lead, arsenic, copper, antimony, black and smokeless powder constituents, chromium, cadmium, nickel, and zinc from small arms. Based on discussions with installation personnel, surface soil sampling has not occurred.

5.3.7. Contaminant Migration Routes

Migration of MEC and MC may occur through surface soil erosion, runoff, and wind and dust generation. Future construction, excavation, and maintenance at the site are also potential release mechanisms for MEC and MC. MC in runoff could potentially end up in surface water or sediment. MC could also potentially leach through soils or surface waters to groundwater.

5.3.8. Receptors and Pathways

Potential receptors at the Salvage Yard Landfill include Navy personnel and Navy-permitted visitors (including contractors). Ecological receptors may come into direct contact with MEC and MC in soil while foraging or burrowing. Ecological receptors may also come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and prey). There is

a potentially complete secondary pathway for the general public, who could come into contact with any MC that flow out of the installation through the surface water system.

5.3.8.1. Nearby Populations

The Town of Fallbrook and San Diego County have populations of 29,100, and 2,813,833, respectively (U.S. Census Bureau, 2000). The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. The Salvage Yard Landfill is approximately 1,000 feet from the housing complex at the installation. See Section 2.1 for more information on the housing complex.

5.3.8.2. Buildings Near/Within Site

There are no buildings on the site. Building 307 is located to the west and Building 365 is located to the east of the Salvage Yard Landfill. Both buildings are used by the Naval Surface Warfare Center (NSWC) Crane for their engineering offices, and have 10 to 15 personnel at any given time.

5.3.8.3. Utilities On/Near Site

The Salvage Yard Landfill has multiple utilities on-site. Water lines run through the central portion of the Salvage Yard Landfill. U.S. government phone lines and phone lines run along the eastern portion of the site. Sewer lines are located in the southern portion of the site. Approximately 0.4 miles to the southwest of the site are additional U.S. government phone lines, water lines, sewer lines, and gas lines.

5.3.9. Land Use

The Salvage Yard Landfill is closed and is no longer in used for disposal.

5.3.10. Access Controls / Restrictions

The Salvage Yard Landfill is located on Detachment Fallbrook, which is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order, and for implementing access control policies and procedures. Once inside the installation, access to the Salvage Yard Landfill is not controlled.

5.3.11. Conceptual Site Model

This CSM was developed following guidance documents issued by the USEPA for hazardous waste sites and the USACE for OE sites. Guidance documents included the USEPA’s Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA/540/G-89/004) and the Final USACE CSM Guidance Development of Integrated Conceptual Site Models for Environmental Ordnance and Explosives (OE) Sites (USACE, 2003).

The CSM describes the site and its environmental setting. The CSM presents information regarding: 1) MEC and/or MC known or suspected to be at the site; 2) current and future reasonably anticipated or proposed uses of the real property; and 3) actual, potentially complete, or incomplete exposure pathways that link them.

The CSM is presented in a series of information profiles that provide information about the site. The information profiles are included in Table 5.3-1 below.

Table 5.3-1: Conceptual Site Model Information Profiles – Salvage Yard Landfill		
Profile Type	Information Needs	Preliminary Assessment Findings
Site Profile	Installation Name	Detachment Fallbrook
	Installation Location	Detachment Fallbrook is located 53 miles north of San Diego in northern San Diego County, CA.
	Site Name	Salvage Yard Landfill
	Site Location	The Salvage Yard Landfill is in the northeast corner of the installation, approximately 1,000 feet from the western corner of the installation housing complex.
	Site History	The Salvage Yard Landfill is a burial area for munitions and dunnage, according to employee interviews, historical records, and recent site visual surveys. In February 2002, suspected 20-mm and 40-mm rounds, as well as some blasting caps, were found on the ground surface.
	Site Area and Layout	The Salvage Yard Landfill occupies approximately 13 acres near Building 307 and Building 365. The landfill is approximately 2,200 feet from the eastern boundary of the installation. Beyond the installation’s boundary is the Town of Fallbrook.

Table 5.3-1: Conceptual Site Model Information Profiles – Salvage Yard Landfill

Profile Type	Information Needs	Preliminary Assessment Findings
	Site Structures	A retaining wall is exposed along western side of the Salvage Yard Landfill. There are no other structures at the landfill.
	Site Boundaries	Map 2 1-1 shows the location of the Salvage Yard Landfill. N: Undeveloped coastal sage scrub, grasslands, and live oak woodland. S: Sparrow Road borders the landfill to the south. Beyond the road is sage dominant vegetation and live oak woodland bordering a creek bed. W: Building 307 and its parking area. E: Building 365 and its parking area and coastal sage scrub.
	Site Security	The Salvage Yard Landfill is located on Detachment Fallbrook, which is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order, and for implementing access control policies and procedures. Once inside the installation, access to the Salvage Yard Landfill is not controlled.
	Munitions Types	Historical records indicate that expended cartridges, primers, live projectiles, and inert anti-tank projectiles were buried in the area. An EOD report from February 2002 states that EOD technicians from MCB Camp Pendleton were called to the site to handle some suspected 20-mm and 40-mm rounds that were found on the ground surface, as well as some blasting caps. The following munitions were observed during Malcolm Pirnie's site visit: a 25-pound bomb, 3-pound pyrotechnic bomb, an MK 76 practice bomb, a 2 36-inch anti-tank HE rocket, a 5-pound practice bomb, 20-mm rounds, other projectiles, several smokeless powder cans and lids, and other munitions scrap.
Munitions/Release Profile	Maximum Probability Penetration Depth	Munitions at the Salvage Yard Landfill would be below surface because of burial and not penetration. The depth of MEC would depend on the construction of the landfill.

Table 5.3-1: Conceptual Site Model Information Profiles – Salvage Yard Landfill

Profile Type	Information Needs	Preliminary Assessment Findings
	MEC Density	The Salvage Yard Landfill has known and suspected MEC areas. The site is suspected to have a medium MEC density; however, some areas of the landfill may have a higher or lower density depending on disposal practices
	MEC Scrap/Fragments	The following munitions were observed during Malcolm Pirnie’s site visit: a 25-pound bomb, a 3-pound pyrotechnic bomb, an MK 76 practice bomb, a 2.36-inch anti-tank HE rocket, a 5-pound practice bomb, 20-mm rounds, other projectiles, several smokeless powder cans and lids, and other munitions scrap
	Associated Munitions Constituents	<p>The primary MC of concern are:</p> <ul style="list-style-type: none">○ 20-mm and 40-mm projectiles: PBX, zirconium pellets, RDX, black powder, HMX, beryllium, chromium, cobalt, copper, lead, manganese, lead azide, lead styphnate, phosphorus, antimony sulfide, zinc, zinc stearate, aluminum, cadmium, chromium, copper salt, cumene hydroperoxide, methyl chloroform, sodium nitrate, toluene, triethylamine, xylenes, zinc phosphate, lead chromate (VI), 2-ethoxyethylacetate, and lead naphthenate;○ 25-pound bomb: red phosphorus, smoke mixture, and titanium tetrachloride;○ 3-pound pyrotechnic bomb: potassium perchlorate, powdered aluminum, black powder, smoke mixture, and lead;○ 2.36-inch anti-tank high explosive rocket: TNT and PETN;○ Smokeless powder cans: smokeless powder;○ Pyrotechnics/blasting caps: titanium tetrachloride, white phosphorus, pyrotechnic composition, lithium hydride, magnesium, RDX, lead styphnate, lead azide, barium, and strontium; and○ Small Arms: lead, antimony, black and smokeless powder constituents, arsenic, copper, chromium, cadmium, nickel, and zinc.

Table 5.3-1: Conceptual Site Model Information Profiles – Salvage Yard Landfill

Profile Type	Information Needs	Preliminary Assessment Findings
	Migration Routes/Release Mechanisms	Migration of MEC and MC may occur through surface soil erosion, runoff, and wind and dust generation. Future construction, excavation, and maintenance at the site are also potential release mechanisms. MC in runoff could potentially end up in surface water or sediment. MC could also potentially leach through soils or surface waters to groundwater.
Physical Profile	Climate	The climate at Detachment Fallbrook is typical of the prevailing coastal southern California Mediterranean climate and is characterized by mild winters, cool summers, and infrequent rainfall. The annual average temperature is 63 °F. Precipitation ranges from 13.7 to 17.1 inches per year, with January being the wettest month and July the driest. Summers at the installation are punctuated by the Santa Ana (offshore) winds.
	Topography	The Salvage Yard Landfill contains low hills and natural ravines.
	Geology	The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information was not available.
	Soil	The soil at the Salvage Yard Landfill is classified as a sandy loam of granitic origin and is moderately well drained.
	Hydrogeology	No site-specific groundwater depth data were available.
	Hydrology	The Salvage Yard Landfill is within the Santa Margarita watershed. There are no permanent surface water bodies in the Salvage Yard Landfill, but there is an intermittent stream that drains to the Santa Margarita River on the northern boundary of the landfill.
	Vegetation	The vegetation in the area of the Salvage Yard Landfill is considered to be mostly coastal sage scrub with some mixed grassland. Common species in mixed grassland habitat include native, perennial bunch mixed with non-native annuals. Common species in coastal sage scrub habitat include coastal sagebrush, flat-topped buckwheat, laurel sumac, sage, goldenbush, and native grasses.

Table 5.3-1: Conceptual Site Model Information Profiles – Salvage Yard Landfill

Profile Type	Information Needs	Preliminary Assessment Findings
Land Use and Exposure Profile	Current Land Use	The Salvage Yard Landfill is closed and is no longer in use
	Current Human Receptors	Navy personnel and Navy-permitted visitors (including contractors). There is also a potentially complete exposure pathway for the general public coming into contact with MC migrating off the installation through the surface water system.
	Current Activities (frequency, nature of activity)	Activities at the site may include environmental and ecological surveys
	Potential Future Land Use	The Salvage Yard Landfill was closed in the early 1960s. There is no anticipated change in current land use.
	Potential Future Human Receptors	Navy personnel and Navy-permitted visitors (including contractors). There is also a potentially complete exposure pathway for the general public coming into contact with MC migrating off the installation through the surface water system.
	Potential Future Land Use-Related Activities:	Any potential future land use activities would have to follow any Navy ESQD Arc waivers or exemptions. Other potential future activities at the site include environmental and ecological surveys.
	Zoning/Land Use Restrictions	Due to the proximity of the site to some of the installation's munitions storage bunkers, ESQD Arc restrictions apply to the area of the former landfill.
	Demographics/Zoning	<p>The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. Demographic data include the following:</p> <ul style="list-style-type: none">• Town of Fallbrook: Population (U.S. Census, 2000): 29,100• San Diego County: Population (U.S. Census, 2000): 2,813,833

Table 5.3-1: Conceptual Site Model Information Profiles – Salvage Yard Landfill

Profile Type	Information Needs	Preliminary Assessment Findings
Ecological Profile	Beneficial Resources	The coastal sage scrub and mixed grasslands habitats offer roosting and foraging resources for raptors. The site is also listed as habitat for the coastal California gnatcatcher, which is a federally protected species, and as a management area for the Stephens' kangaroo rat.
	Habitat Type	The Salvage Yard Landfill contains coastal sage scrub and some mixed grasslands habitat. The landfill is also in a zone designated as habitat for the federally endangered coastal California gnatcatcher and the Stephens' kangaroo rat.
	Degree of Disturbance	Current and anticipated future activities at the site, such as environmental and ecological surveys, may disturb habitat and or ecological receptors known or potentially present within range areas.
	Ecological Receptors	
	General:	Common fauna included mammals (kangaroo rats, voles, deer, mice, ground squirrels, opossum, rabbits, and coyotes), amphibians (tree frogs), reptiles (orange-throated whiptails, rattlesnakes, and horned lizards), and birds (burrowing owls, kites, quails, sparrows, kingbirds, and hawks). Pets from the housing complex are also a potential receptor covered under domestic animals in the CSM.
	Federal Endangered Species:	Stephens' kangaroo rat and Least Bell's vireo
	Federal Threatened Species:	Coastal California gnatcatcher
	State Endangered Species:	Least Bell's vireo
	State Threatened Species:	Stephens' kangaroo rat
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	Potential human receptors at the site include Navy personnel, visitors, and private contractors. Ecological receptors may come into direct contact with MEC/MC in soil while foraging or burrowing. Ecological receptors may also come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and prey). There is also a potentially complete exposure pathway for the general public coming into contact with MC migrating off the installation through the surface water system.

A key element of the CSM is the exposure pathway analysis, which is performed separately for MEC and for MC.

For MEC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MEC are expected to be found); 2) access (e.g., controlled or uncontrolled access, items on the surface or within the subsurface); 3) an activity (e.g., non-intrusive grounds maintenance or intrusive construction); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, authorized visitors, or ecological receptors). It is important to recognize that environmental mechanisms (e.g., erosion) and/or human intervention may result in the repositioning of MEC.

For MC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MC are expected to be found); 2) an exposure medium (e.g., surface soil); 3) an exposure route (e.g., dermal contact); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, authorized visitors, or ecological receptors). If the point of exposure is not at the same location as the source, the pathway may also include a release mechanism (e.g., volatilization) and a transport medium (e.g., air).

The potential interactions between the source and receptors are assessed differently between MEC and MC. For MC, interaction between the source and receptors involves a release mechanism for the MC, an exposure medium that contains the MC, and an exposure route that places the receptor into contact with the contaminated medium. For MEC, interaction between the potential receptors and an MEC source has two components. The receptor must have access to the source and must engage in some activity that results in contact with individual MEC items within the source area.

MEC Interactions and Pathway Analysis

The exposure pathway analysis for MEC is shown in Figure 5.3-4 because historical and visual evidence indicate that MEC is present at the Salvage Yard Landfill. MEC was observed on the surface and is likely to be present in the subsurface at the site. Potential receptors include both human (Navy personnel and contractors/visitors) and ecological receptors (biota and domestic animals [i.e., pets]) that may come in contact with suspected MEC. The release mechanism of handling/treading underfoot activities creates a complete pathway for all human receptors and ecological receptors (biota and domestic animals) for MEC on the surface of the site. The release

mechanism of intrusive activities (such as digging or drilling) creates a potentially complete pathway for human and ecological receptors (biota and domestic animals) both for MEC on the surface and subsurface at the site.

MC Interactions and Pathway Analysis

The exposure pathway analysis for MC is shown in Figure 5 3-5. Potential receptors include both human (Navy personnel, contractor/visitor, general public) and ecological receptors (biota) that may come in contact with MC in the source medium or other potentially contaminated media. Pathways are shown for each medium and are discussed below. For MC, interaction between the source (e.g., the burial trenches) and receptors generally involves a release mechanism for the MC (e.g., runoff to surface water, uptake into the food chain), an exposure medium containing the MC (e.g., soil, surface water, groundwater), and an exposure route (e.g., incidental ingestion, dermal contact) that places the receptor into contact with the contaminated medium.

Surface Water/Sediment

As discussed earlier, there are no named surface water bodies at the Salvage Yard Landfill. Yet, because the site has an ephemeral stream that drains into the Santa Margarita River, MC could potentially become available to receptors in surface water or sediment. The pathway for surface water and/or sediment is considered potentially complete at the Salvage Yard Landfill for all receptors. There is also a potentially complete exposure pathway for the general public coming into contact with MC migrating off the installation through the surface water system.

Plant/Animal Uptake

Potentially complete pathways are indicated for biota and domestic animals (i.e. pets) exposed to MC at the Salvage Yard Landfill via the food chain. MC may be taken up by plants and/or prey and consumed by biota and/or domestic animals at the landfill.

Surface Soil

Potentially complete pathways exist for all receptors (except the general public) via all exposure routes for surface soil contaminated with MC at the Salvage Yard Landfill because MC are suspected to reside in the surface soil (i.e., 0 to 2 feet below ground surface). Dust inhalation exposures for human receptors, domestic animals, and biota are anticipated due to the low vegetative cover on the existing soils. Any future movement or grading of surface soils could make MC available for wind distribution and subsequent inhalation.

Subsurface Soil

Potentially complete pathways exist for all receptors (except the general public) via all exposure routes at the Salvage Yard Landfill. Biota and domestic animals might come into contact with the contaminated soil by burrowing and/or ingesting. Navy personnel and contractors might engage in excavation or drilling activities, which could facilitate the movement of surface contamination to the subsurface.

Groundwater

Potentially complete pathways for Navy personnel and contractors/visitors are indicated for groundwater contaminated with MC at the Salvage Yard Landfill. Navy personnel and contractors/visitors may come into contact with groundwater during environmental investigations (e.g., monitoring well installation and sampling) at the former site. The potential for groundwater impacts is considered to be incomplete for all other receptors.

An exposure pathway does not exist for MC volatilizing into the air for all receptors.

5.3.12. Summary

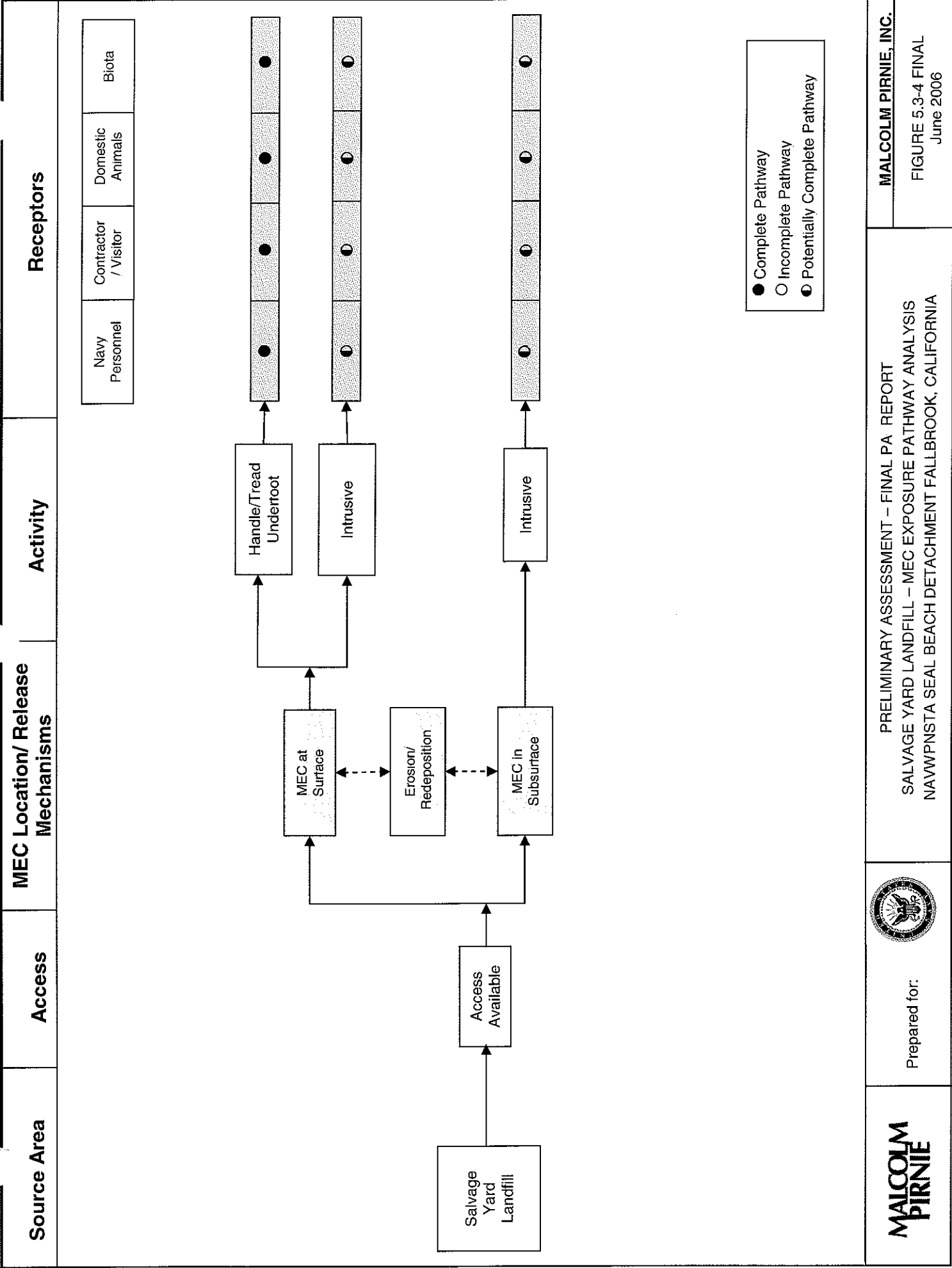
The Salvage Yard Landfill (IRP Site 33) covers approximately 13 acres in the northeast corner of the installation, approximately 900 feet from the western corner of the installation. The Salvage Yard Landfill is a burial area for munitions and dunnage, according to personnel interviews, historical records, and recent visual surveys. On historical maps, the area is labeled as a storage yard starting in the 1950s and ending in the late 1960s. It was also used as a disposal area during this time. Historical records indicate that expended cartridges, primers, live projectiles, and inert anti-tank projectiles were buried in the area. An EOD report from February 2002 describes an incident in which EOD technicians from MCB Camp Pendleton were called to the site to handle some suspected 20-mm and 40-mm rounds that were found on the ground surface, as well as some blasting caps. The area is not currently in use. The following MEC were observed during the visual surveys: a 25-pound bomb, a 3-pound pyrotechnic bomb, a 2 36-inch anti-tank HE rocket, 20-mm rounds, other projectiles, and other munitions scrap.

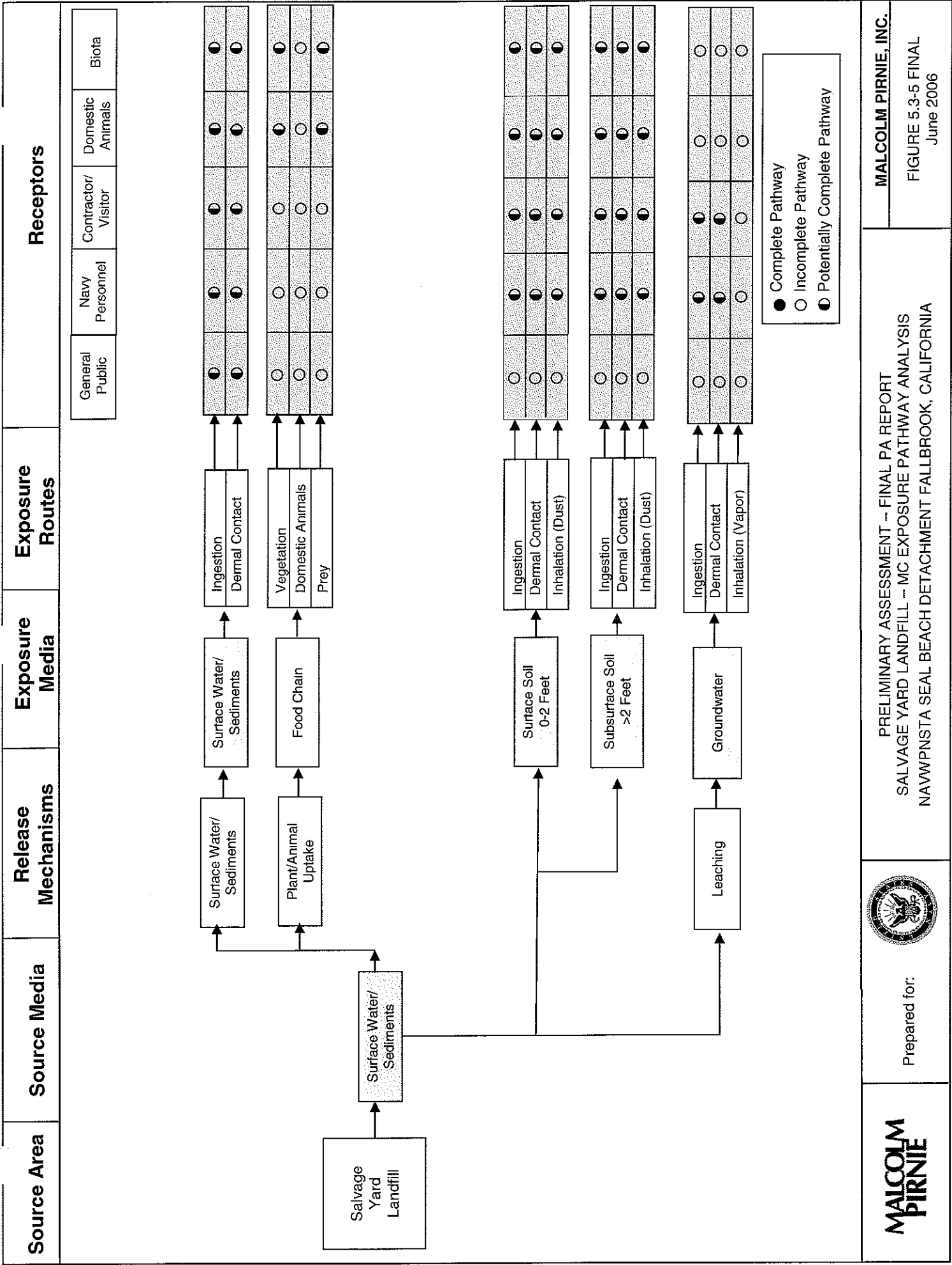
5.3.13. Recommendations

Based on the data collected and presented in this PA, an SI is recommended for both MEC and MC at the Salvage Yard Landfill. The SI activities should focus on determining the extent of MEC and MC at the site. During the SI, it is recommended that surface and subsurface soil

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samples be collected from the site and analyzed for ordnance residuals and metals. It is also recommended that groundwater monitoring wells be installed to verify that the groundwater under the site has not been affected. If intrusive activities are planned for the site, the potential receptors should be made aware that the site was a munitions burial site.







Preliminary Assessment
NAVWPNSTA Seal Beach
Detachment Fallbrook, California




**MALCOLM
PIRNIE**

Map 5.3-1
Visual Survey
Salvage Yard Landfill Near
Building 307 (IRP Site 33)

Legend

-  Salvage Yard Landfill Near Building 307
-  Site Reconnaissance Path

0 60 120 Meters



Data Source: Anteon Corporation,
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006







**Preliminary Assessment
NAVWPNSTA Seal Beach
Detachment Fallbrook, California**



**MALCOLM
PIRNIE**

**Map 5.3-2
Site Details
Salvage Yard Landfill Near
Building 307 (IRP Site 33)**

Legend

-  Salvage Yard Landfill Near Building 307
-  Streams
-  Topographic Contours (ft above MSL)
-  Buildings

0 60 Meters

Data Source: Anteon Corporation
Orthophoto, June 3, 2004
NAVWPNSTA Seal Beach GIS Data,
Vector Contour Data

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006

NAVWPNSTA Seal Beach
Detachment Fallbrook, California
Salvage Yard Landfill Near
Building 307



Preliminary Assessment
NAWPNSTA Seal Beach
Detachment Fallbrook, California



MALCOLM
PIRNIE

Map 5.3-3
Munitions Characterization
Salvage Yard Landfill Near
Building 307 (IRP Site 33)

Legend

- Salvage Yard Landfill
Near Building 307
- MEC Sighting
- Evidence of Munitions Use

MEC Presence*

- Known
- Suspect

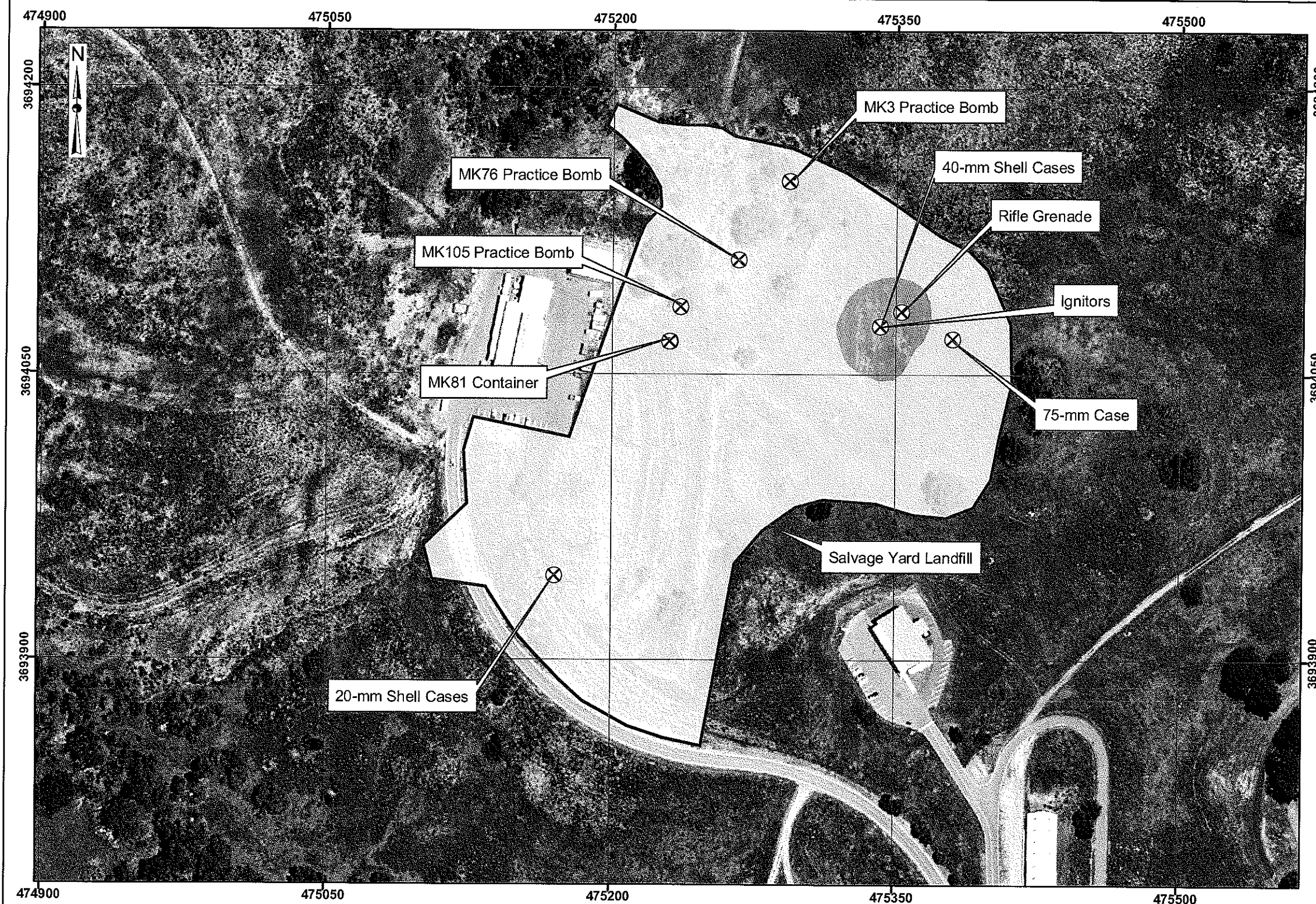
* MEC presence was determined
through review of historical documentation,
interviews, and visual survey.

0 60 Meters

Data Source: Anteon Corporation,
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006



5.4. Dunnage Disposal Site #1

The Dunnage Disposal Site #1 occupies about 3.3 acres located in the north-central portion of the Detachment Fallbrook. The site is L-shaped, extending north and east along two intermittent stream beds.

5.4.1. History and Site Description

The Dunnage Disposal Site #1 (IRP Site 34a) is a potential munitions burial site. The site occupies approximately 3.3 acres and was in use from 1942 to 1978 as a disposal area for dunnage. According to personnel interviews and historical documents, the site may also have been used as a disposal area for ordnance. The area is not currently in use. There is no evidence of recent deeper excavations or other intrusions that could have redistributed MEC and MC. The Dunnage Disposal Site #1 was originally identified under the IRP as Site 34a, but is now being addressed under the MRP. No IRP investigations were undertaken.

5.4.1.1. Topography

The Dunnage Disposal Site #1 contains low hills with some moderately deep ravines created by runoff and ephemeral streams. For further information on the topography of Detachment Fallbrook, see Section 3.2.

5.4.1.2. Geology

The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information for the Dunnage Disposal Site #1 was not available. Section 3.3 includes a general description of the geology of Detachment Fallbrook.

5.4.1.3. Soil and Vegetation Types

Soils in the Dunnage Disposal Site #1 are classified as a sandy loam of granitic origin and are moderately well drained. Section 3.4 includes a general description of the soil types at Detachment Fallbrook.

The vegetation in the area of the Dunnage Disposal Site #1 is considered to be mostly coastal sage scrub with some riparian habitat along the intermittent stream beds. Common species in coastal sage scrub habitat include coastal sagebrush (*Artemisia californica*), flat-topped buckwheat (*Erigonum fasciculatum*), laurel sumac (*Malosma laurina*), sage (*Salvia* spp.), goldenbush (*Isocoma menziesii*), and native grasses (*Nassella* spp.). Common species with

riparian habitat include mulefat (*Baccharis salicifolia*) with some arroyo willows (*Salix lasiolepis*) and elderberry (*Sambucus mexicana*). Section 3.5 includes a general description of the vegetation types at Detachment Fallbrook.

5.4.1.4. Hydrology

Dunnage Disposal Site #1 is within the Santa Margarita watershed. There are no permanent surface water bodies in the Dunnage Disposal Site #1, though intermittent streams tend to develop during the rainy season. The site drains primarily into Fallbrook Creek. Section 3.6 includes a general description of the hydrology at Detachment Fallbrook.

5.4.1.5. Hydrogeology

No site-specific groundwater depth data were available. Section 3.7 includes a general description of the hydrogeology at Detachment Fallbrook.

5.4.1.6. Cultural and Natural Resources

The data collection team for the Dunnage Disposal Site #1 found documentation of one significant cultural resource near the site. The cultural resource is a prehistoric site. To preserve the integrity of the cultural resource, more specific information is not included in this document. Detachment Fallbrook has large areas of undisturbed land that can serve as suitable habitat to threatened and endangered species. Section 3.8 includes a general description of the cultural and natural resources at Detachment Fallbrook.

5.4.1.7. Endangered and Special Status Species

Threatened and endangered species data for Detachment Fallbrook are presented in Section 3.9. According to the California Wildlife and Habitat Analysis Branch, threatened and endangered species associated with the critical habitats of the former range that are known or have been documented within or adjacent to the Detachment Fallbrook are the coastal California gnatcatcher, Stephens' kangaroo rat, Arroyo toad, Southwestern willow flycatcher, and the Least Bell's vireo.

5.4.2. Visual Survey Observations and Results

The data collection team conducted two visual surveys of the Dunnage Disposal Site #1: one on September 28, 2004 and the second on March 8, 2005. Present during the two visual surveys were Mr. Chip Poalinelli, Mr. Al Larkins (September 2004 only), Mr. Dan Hains (March 2005).

only), and Mr. Scott Lehman. The following Navy representatives were present during the September 2004 visual survey: Ms. Pei-Fen Tamashiro, Mr. Robbie Knight, and Mr. Si Le. The field team conducted the visual survey by walking the perimeter of the disposal site, then walking several transects of it. The following munitions were observed during both visual surveys: various inert rocket motors, practice 2,000-pound bombs, a HE 20-mm projectile, several igniters, and other munitions scrap on the ground surface and in the wash area. There was also a large quantity of non-munitions related trash at the site. Figure 5.4-1 shows a photograph of the site during the September 2004 visual survey. Figure 5.4-2 shows a photograph of a practice bomb identified at the site during the March 2005 visual survey. A visual depiction of the site reconnaissance is provided on Map 5.4-1 located at the end of Section 5.4. Additional site details are illustrated on Map 5.4-2, also located at the end of Section 5.4.



Figure 5.4-1: Photograph was taken during the September 2004 visual survey. View of the 2000-pound bombs at the Dunnage Disposal Site #1 looking northwest.



Figure 5.4-2: Photograph was taken during March 2005 visual survey, showing one of the practice 2,000-pound bombs identified at the Dunnage Disposal Site #1.

5.4.3. Munitions and Munitions Related Materials Associated with the Site

This section describes the munitions or munitions related materials, including the types and estimated maximum penetration depths, known or suspected to be at the Dunnage Disposal Site #1. This includes both MEC and non-hazardous munitions related scrap (e.g., fragments, base plates, and inert mortar fins).

The data collection team did not find any records detailing the types of munitions disposed or buried at the Dunnage Disposal Site #1. The following munitions were observed during Malcolm Pirnie's site visit: inert rocket motors, practice 2,000-pound bombs, a HE 20-mm projectile, several igniters, and other scrap. The available technical data sheets on these items are included in Appendix D.

Based on the information obtained during the data collection process, Dunnage Disposal Site #1 is not suspected to contain CWM filled munitions, electrically fused munitions, or DU associated munitions.

5.4.4. MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence including: Known MEC Areas, Suspected MEC Areas, and Areas Not Suspected to Contain MEC to indicate that MEC is known or is suspected to be at the site. Map 5-4-3 illustrates the munitions characterization of the Dunnage Disposal Site #1, and is provided at the end of Section 5.4. The MEC presence is discussed below.

5.4.4.1. Known MEC Areas

The Dunnage Disposal Site #1 has Known MEC Areas. The following munitions were observed during Malcolm Pirnie's site visit: inert rocket motors, practice 2,000-pound bombs, a HE 20-mm projectile, several igniters, and other scrap.

5.4.4.2. Suspected MEC Areas

The Dunnage Disposal Site #1 has Suspected MEC Areas. Based on historical use of the site, MEC may be present on the surface and subsurface of the Dunnage Disposal Site #1. Since only a visual survey was conducted of the site, there is a great possibility that MEC could reside in the subsurface.

5.4.4.3. Areas Not Suspected to Contain MEC

Based on available documents and the site walk, the approximately 3.3 acres of the Dunnage Disposal Site #1 are suspected to contain MEC pending further investigation.

5.4.5. Ordnance Penetration Estimates

Munitions found below the ground surface at the Dunnage Disposal Site #1 would be due to burial not penetration. The depth of MEC would depend on the disposal site's construction.

5.4.6. Munitions Constituents

The primary munitions of concern at the Dunnage Disposal Site #1 include PBX, zirconium pellets, RDX, and aluminum from 20-mm projectiles and white phosphorous, pyrotechnic composition, lithium hydride, magnesium, titanium tetrachloride, RDX, lead styphnate, lead azide, barium, and strontium from pyrotechnics.

5.4.7. Contaminant Migration Routes

Migration of MEC and MC may occur through surface soil erosion, runoff, and wind and dust generation. Future construction, excavation, and maintenance at the site are also potential release mechanisms for MEC and MC. MC in runoff could potentially end up in surface water or sediment. MC could also potentially leach through soils or surface waters to groundwater.

5.4.8. Receptors and Pathways

Potential receptors at the Dunnage Disposal Site #1 include Navy personnel, visitors, and contractors. Ecological receptors may come into direct contact with MEC and/or MC in soil while foraging or burrowing. Ecological receptors may also come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and prey). There is a potentially complete secondary pathway for the general public, who could come into contact with any MC that flow out of the installation through the surface water system.

5.4.8.1. Nearby Populations

Fallbrook and San Diego County have populations of 29,100, and 2,813,833, respectively (U.S. Census Bureau, 2000). The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. The Dunnage Disposal Site #1 is approximately 8,530 feet from the housing complex at the installation. See Section 2.1 for more information on the housing complex.

5.4.8.2. Buildings Near/Within Site

There are no buildings on the site. The closest building to the Dunnage Disposal Site #1 is Building 301, located to the north of Redeye Road. Building 301 is the VERTREP Storage Locker, which is accessed by two to three people per day.

5.4.8.3. Utilities On/Near Site

There are no visible utilities on the Dunnage Disposal Site #1. To the north and east are phone lines, U.S. government phone lines, and water lines.

5.4.9. Land Use

The Dunnage Disposal Site #1 is closed and is no longer used for disposal.

5.4.10. Access Controls / Restrictions

The Dunnage Disposal Site #1 is located on Detachment Fallbrook, which is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order, and for implementing access control policies and procedures. The Dunnage Disposal Site #1 is also located within a restricted area guarded by the security force.

5.4.11. Conceptual Site Model

This CSM was developed following guidance documents issued by the USEPA for hazardous waste sites and the USACE for OE sites. Guidance documents included the USEPA's Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA/540/G-89/004) and the Final USACE CSM Guidance Development of Integrated Conceptual Site Models for Environmental Ordnance and Explosives (OE) Sites (USACE, 2003).

The CSM describes the site and its environmental setting. The CSM presents information regarding: 1) MEC and/or MC known or suspected to be at the site; 2) current and future reasonably anticipated or proposed uses of the real property; and 3) actual, potentially complete, or incomplete exposure pathways that link them.

The CSM is presented in a series of information profiles that provide information about the site. The information profiles are included in Table 5.4-1 below.

Table 5.4-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #1		
Profile Type	Information Needs	Preliminary Assessment Findings
Site Profile	Installation Name	Detachment Fallbrook
	Installation Location	Detachment Fallbrook is located 53 miles north of San Diego in northern San Diego County, CA.
	Site Name	Dunnage Disposal Site #1 (IRP Site 34a)
	Site Location	The Dunnage Disposal Site #1 is in the north-central portion of the installation.
	Site History	The Dunnage Disposal Site #1 is a burial area for dunnage and potentially for munitions, according to employee interviews and historical documents. The site was used from 1942 until 1978.

Table 5.4-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #1

Profile Type	Information Needs	Preliminary Assessment Findings
	Site Area and Layout	The Dunnage Disposal Site #1 occupies approximately 3.3 acres. It extends north and east in an “L” shape following two intermittent stream beds.
	Site Structures	There are no structures currently on the Dunnage Disposal Site #1.
	Site Boundaries	Map 2.1-1 shows the location of the Dunnage Disposal Site #1. N: An unpaved road borders the site to the north with a coastal sage scrub open area beyond. Further north is Redeye Road, Building 301, and a magazine area. S: To the south, the site is bordered by coastal sage scrub habitat. Magazine and parking areas are located farther south. W: To the west, the site is bordered by coastal sage scrub habitat. Magazine areas are located farther west. E: East of the site is Redeye Road and a magazine area.
	Site Security	The Dunnage Disposal Site #1 is located on Detachment Fallbrook, which is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order, and for implementing access control policies and procedures. The Dunnage Disposal Site #1 is also located within a restricted area guarded by the security force.
Munitions/ Release Profile	Munitions Types	The following munitions were observed during Malcolm Pirnie’s site visit: inert rocket motors, practice 2,000-pound bombs, a suspected HE 20-mm projectile, several igniters, and other scrap.
	Maximum Probability Penetration Depth ¹	Munitions at the Dunnage Disposal Site #1 would be below surface because of burial and not penetration. The depth of MEC would depend on the construction of the disposal site.
	MEC Density	The Dunnage Disposal Site #1 has known and suspected MEC areas. The site is suspected to have a medium MEC density; however, some areas of the site may have a higher or lower density depending on disposal practices.

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Table 5.4-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #1		
Profile Type	Information Needs	Preliminary Assessment Findings
	MEC Scrap/Fragments	The following munitions were observed during Malcolm Pirnie's site visit: inert rocket motors, practice 2,000-pound bombs, a HE 20-mm projectile, several igniters, and other scrap.
	Associated Munitions Constituents	The primary MC of concern are: <ul style="list-style-type: none"> ○ 20-mm projectile: PBX, HMX, zirconium pellets, fluoroelastomers, RDX, aluminum; and ○ Pyrotechnics: white phosphorus, pyrotechnic composition, lithium hydride, magnesium, titanium tetrachloride, RDX, lead styphnate, lead azide, barium, and strontium
	Migration Routes/Release Mechanisms	Migration of MEC and MC may occur through surface soil erosion, runoff, and by wind and dust generation. Future construction, excavation, and maintenance at the site are also potential release mechanisms. MC in runoff could potentially end up in surface water or sediment. MC could also potentially leach through soils or surface waters to groundwater.
Physical Profile	Climate	The climate at Detachment Fallbrook is typical of the prevailing southern California Mediterranean climate and is characterized by mild winters, cool summers, and infrequent rainfall. The annual average temperature is 63 °F. Precipitation ranges from 13.7 to 17.1 inches per year, with January being the wettest month and July the driest. Summers at the installation are punctuated by the Santa Ana (offshore) winds.
	Topography	The Dunnage Disposal Site #1 contains low hills with some moderately deep ravines created by runoff and ephemeral streams.
	Geology	The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information was not available.
	Soil	The soil at the Dunnage Disposal Site #1 is classified as a sandy loam of granitic origin and is moderately well drained.
	Hydrogeology	No site-specific groundwater depth data were available.

Table 5.4-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #1

Profile Type	Information Needs	Preliminary Assessment Findings
	Hydrology	The Dunnage Disposal Site #1 is within the Santa Margarita watershed. There are no permanent surface water bodies in the Dunnage Disposal Site #1 Area, yet intermittent streams develop on the installation during the rainy season and some of them run through Dunnage Disposal Site #1. The Dunnage Disposal Site #1 drains primarily into Fallbrook Creek, about 40 feet to the north and northwest of the site's boundary.
	Vegetation	The vegetation in the area of Dunnage Disposal Site #1 is considered to be mostly coastal sage scrub with some riparian habitat (along the intermittent stream beds). Common species in coastal sage scrub habitat include coastal sagebrush, flat-topped buckwheat, laurel sumac, sage, goldenbush, and native grasses. Common species in riparian habitat include mulefat, arroyo willows, and elderberry.
Land Use and Exposure Profile	Current Land Use	The Dunnage Disposal Site #1 is closed and is no longer in use.
	Current Human Receptors	Navy personnel and Navy-permitted visitors (including contractors).
	Current Activities (frequency, nature of activity)	Activities at the site may include environmental and ecological surveys.
	Potential Future Land Use	The Dunnage Disposal Site #1 was closed in 1978. There is no change in land use planned.
	Potential Future Human Receptors	Navy personnel and Navy-permitted visitors (including contractors).
	Potential Future Land Use-Related Activities:	Any potential future land use activities would have to follow any Navy ESQD Arc waivers or exemptions. Other potential future activities at the site include environmental and ecological surveys.
	Zoning/Land Use Restrictions	ESQD Arc restrictions apply to the area of the Dunnage Disposal Site #1.

Table 5.4-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #1		
Profile Type	Information Needs	Preliminary Assessment Findings
	Demographics/Zoning	<p>The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. Demographic data include the following:</p> <ul style="list-style-type: none"> Town of Fallbrook: Population (U.S. Census, 2000): 29,100 San Diego County: Population (U.S. Census, 2000): 2,813,833
	Beneficial Resources	The coastal sage scrub habitat offers roosting and foraging resources for raptors. The site is within the designated habitat for the coastal California gnatcatcher.
Ecological Profile	Habitat Type	The Dunnage Disposal Site #1 contains coastal sage scrub and some riparian habitat. The Dunnage Disposal Site #1 is also in a zone designated as habitat for the federally endangered coastal California gnatcatcher.
	Degree of Disturbance	Current and anticipated future activities at the site, such as environmental and ecological surveys, may disturb habitat and/or ecological receptors known or potentially present within range areas.
	Ecological Receptors	
	General:	Common fauna included mammals (kangaroo rats, voles, deer, mice, ground squirrels, opossum, rabbits, and coyotes), amphibians (tree frogs), reptiles (orange-throated whiptails, rattlesnakes, and horned lizards), and birds (burrowing owls, kites, quails, sparrows, kingbirds, and hawks).
	Federal Endangered Species:	Least Bell's vireo, Stephens' kangaroo rat, Arroyo toad, and Southwestern willow flycatcher.
	Federal Threatened Species:	Coastal California gnatcatcher.
	State Endangered Species:	Least Bell's vireo and Southwestern willow flycatcher.
	State Threatened Species:	Stephens' kangaroo rat.

Table 5.4-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #1		
Profile Type	Information Needs	Preliminary Assessment Findings
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	Potential human receptors at the site include Navy personnel, visitors, and private contractors. Ecological receptors may come into direct contact with MEC and/or MC in surface and/or subsurface soil while foraging or burrowing. Ecological receptors may also come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and prey). There is a potentially complete secondary pathway for the general public, who could come into contact with any MC that flow out of the installation through the surface water system.

A key element of the CSM is the exposure pathway analysis, which is performed separately for MEC and for MC.

For MEC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MEC are expected to be found); 2) access (e.g., controlled or uncontrolled access, items on the surface or within the subsurface); 3) an activity (e.g., non-intrusive grounds maintenance or intrusive construction); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, authorized visitors, or ecological receptors). It is important to recognize that environmental mechanisms (e.g., erosion) and/or human intervention may result in the repositioning of MEC.

For MC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MC are expected to be found); 2) an exposure medium (e.g., surface soil); 3) an exposure route (e.g., dermal contact); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, authorized visitors, or ecological receptors). If the point of exposure is not at the same location as the source, the pathway may also include a release mechanism (e.g., volatilization) and a transport medium (e.g., air).

The potential interactions between the source and receptors are assessed differently between MEC and MC. For MC, interaction between the source and receptors involves a release mechanism for the MC, an exposure medium that contains the MC, and an exposure route that places the receptor into contact with the contaminated medium. For MEC, interaction between

the potential receptors and an MEC source has two components. The receptor must have access to the source and must engage in some activity that results in contact with individual MEC items within the source area.

MEC Interactions and Pathway Analysis

The exposure pathway analysis for MEC is shown in Figure 5.4-3 because historical and visual evidence indicate that MEC could be present at the Dunnage Disposal Site #1. MEC and munitions scraps were observed on the surface and could potentially be present in the subsurface at the site. The release mechanism of handling/treading underfoot activities creates a complete exposure pathway for all human receptors and biota for MEC on the surface of the site. The release mechanism of intrusive activities (such as digging or drilling) creates a potentially complete exposure pathway for human and ecological receptors for MEC both on the surface (0 to 2 feet) and in the subsurface at the site.

MC Interactions and Pathway Analysis

The exposure pathway analysis for MC is shown in Figure 5.4-4. Potential receptors include both human (Navy personnel and contractor/visitor) and ecological receptors (biota) that may come in contact with MC in the source medium or other potentially contaminated media. Pathways are shown for each medium and are discussed below. For MC, interaction between the source (e.g., burial pits) and receptors generally involves a release mechanism for the MC (e.g., runoff to surface water, leaching to groundwater, or uptake into the food chain), an exposure medium containing the MC (e.g., soil, sediment, or groundwater), and an exposure route (e.g., incidental ingestion, dermal contact, or inhalation) that places the receptor into contact with the contaminated medium.

Surface Water/Sediment

As discussed earlier, intermittent streams develop on the installation during the rainy season and some of them run through the Dunnage Disposal Site #1. MC in runoff could potentially become available to receptors in surface water or sediment. The exposure pathway for surface water and/or sediment is considered potentially complete for both human and ecological receptors. There is a potentially complete secondary pathway for the general public, who could come into contact with any MC that flow out of the installation through the surface water system.

Plant/Animal Uptake

Potentially complete pathways are indicated for biota (wildlife) exposed to MC at the Dunnage Disposal Site #1 via the food chain. MC may be taken up by plants and prey and consumed by biota.

Surface Soil

Potentially complete pathways exist for all receptors (except for the general public) via all exposure routes for surface soil contaminated with MC at the Dunnage Disposal Site #1. It is suspected that MC resides in the surface soil (i.e., 0 to 2 feet below ground surface) at the Dunnage Disposal Site #1. Inhalation exposures to humans or biota from inhalation of dust are anticipated due to the low vegetative cover on the existing soils. Any future movement or grading of surface soils could make MC available for wind distribution and subsequent inhalation.

Subsurface Soil

Potentially complete subsurface soil pathways for biota and for Navy personnel and contractors are expected to exist at the Dunnage Disposal Site #1. Biota might come into contact with the contaminated soil by burrowing and/or ingesting. Navy personnel and contractors might engage in excavation or drilling activities, which could facilitate the movement of surface contamination to the subsurface.

Groundwater

Potentially complete pathways for Navy personnel and contractors/visitors are indicated for groundwater contaminated with MC at the Dunnage Disposal Site #1. Navy personnel and contractors/visitors may come into contact with groundwater during environmental investigations (e.g., monitoring well installation and sampling) at the site. The potential for groundwater impacts is considered to be incomplete for all other receptors.

An exposure pathway does not exist for MC volatilizing into the air for all receptors.

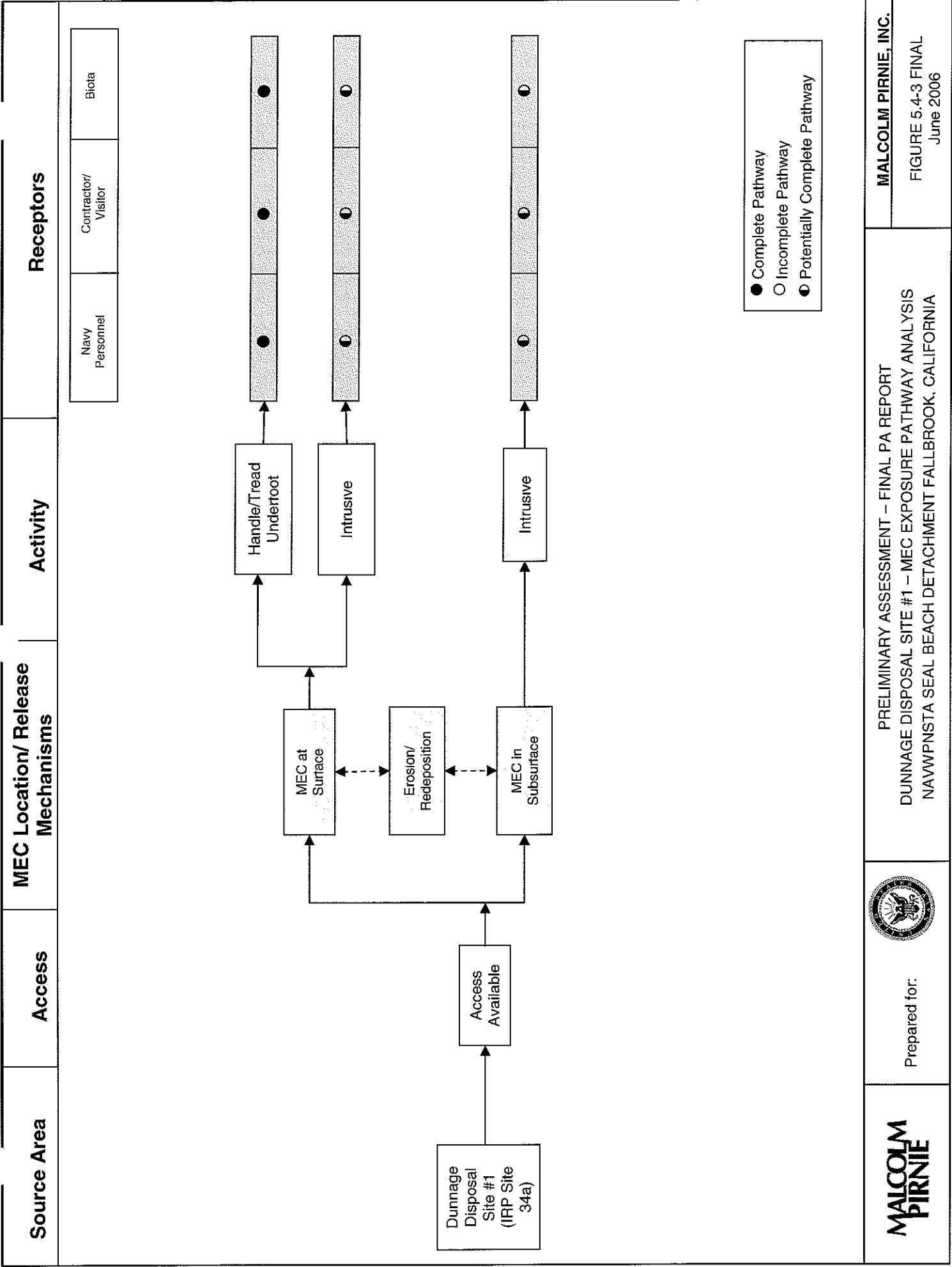
5.4.12. Summary

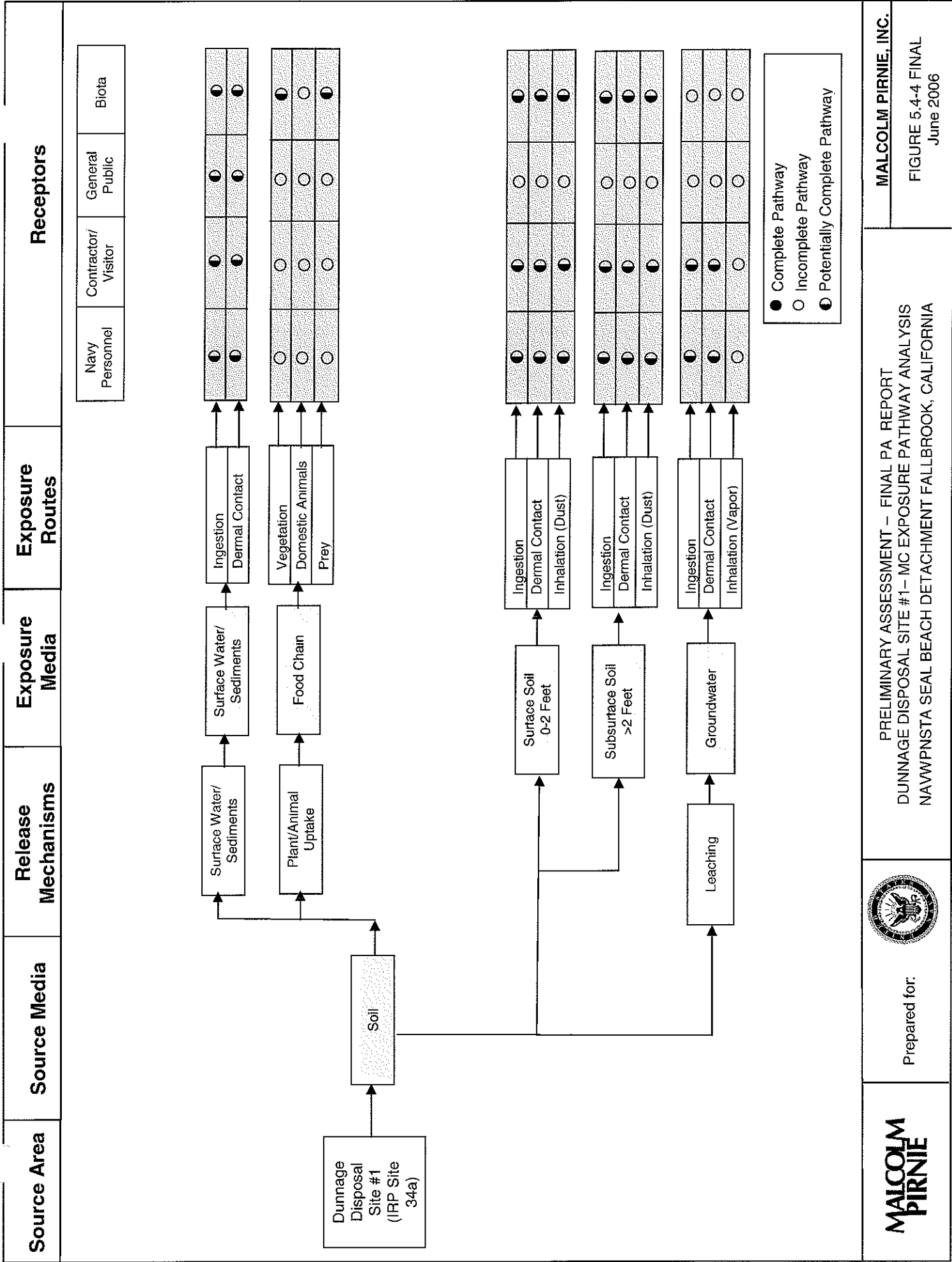
The 3.3-acre Dunnage Disposal Site #1 (IRP Site 34a) is located in the north-central portion of the Detachment Fallbrook. The site is L-shaped, extending north and east along two intermittent stream beds. The Dunnage Disposal Site #1 is a potential munitions burial site. The site was in

use from 1942 to 1978 as a disposal area for dunnage. According to personnel interviews and historical documents, the site was used as a disposal area for ordnance. A limited visual survey of the area revealed various inert rocket motors, practice 2000-pound bombs, a HE 20-mm projectile, several igniters, and other munition scrap at the site. The site is known to contain MEC and suspected to contain MC. The site is not currently in use.

5.4.13. Recommendations

Based on the data collected and presented in this PA, an extended SI (including a geophysical survey) is recommended for MEC at the Dunnage Disposal Site #1. The SI activities should focus on determining if any additional MEC is present at the site. An SI is also recommended for MC at the disposal site. During the SI, it is recommended that surface and subsurface soil samples be collected from the site and analyzed for ordnance residuals and metals. It is also recommended that a groundwater monitoring well be installed to verify that the groundwater under the site has not been affected. If intrusive activities are planned for the site, the potential receptors should be made aware that the site was a munitions burial site.







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Map 5.4-1
Visual Survey
Dunnage Disposal Site #1 (IRP Site 34a)

Legend

-  Dunnage Disposal Site #1
-  Site Reconnaissance Path

0 75 150 Meters

Data Source: Anteon Corporation,
Orthophoto June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
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**Map 5.4-2
Site Details
Dunnage Disposal Site #1 (IRP Site 34a)**

Legend

-  Dunnage Disposal Site #1
-  Streams
-  Topographic Contours (ft above MSL)
-  55 Gallon Drum

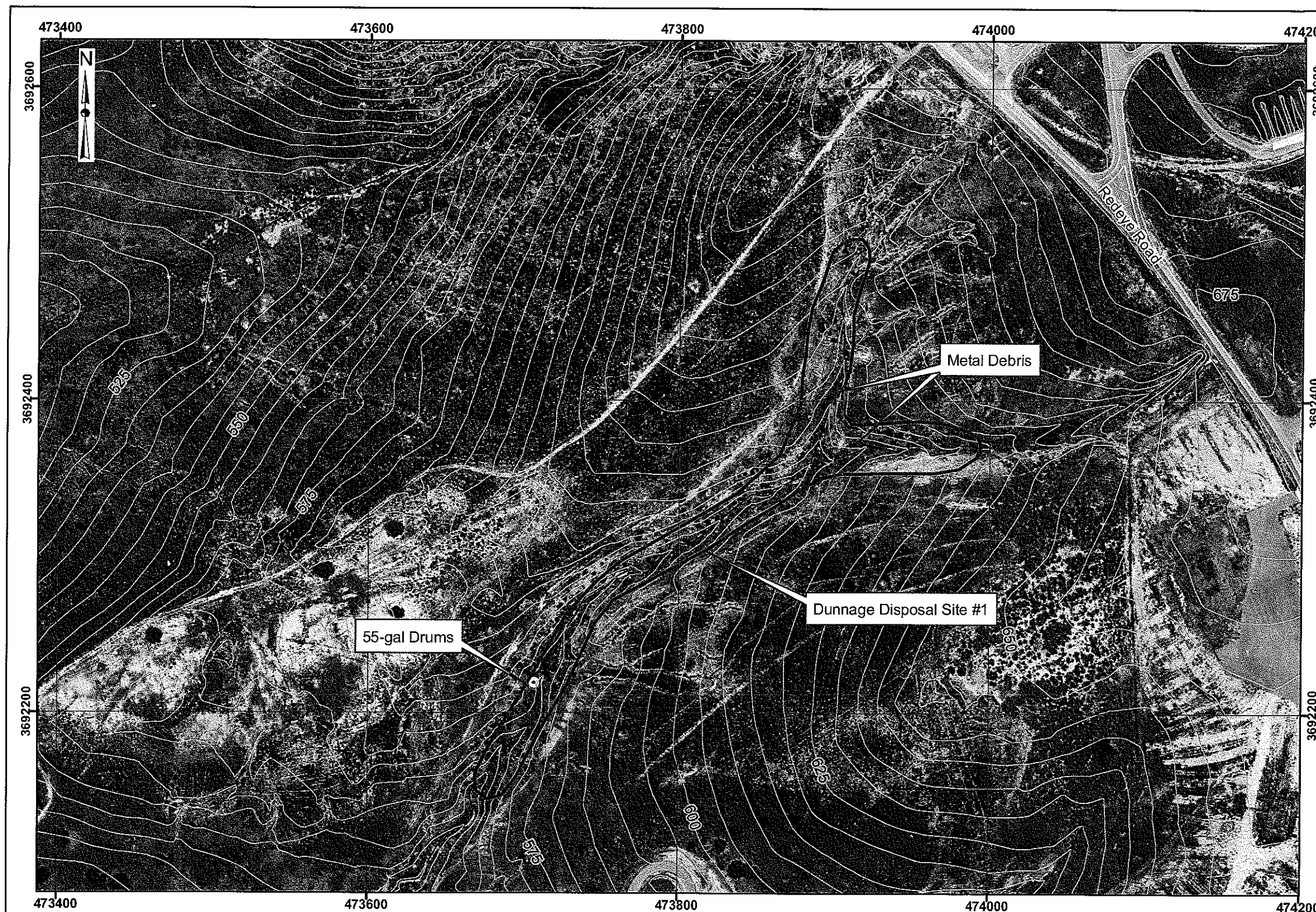
0 75 Meters

Data Source: Anteon Corporation,
Orthophoto, June 3 2004
NAWPNSTA Seal Beach GIS Data,
Vector Contour Data

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

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NAWPNSTA Seal Beach
Detachment Fallbrook, California
Dunnage Disposal Site #1



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Detachment Fallbrook, California



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Map 5.4-3
Munitions Characterization
Dunnage Disposal Site #1 (IRP Site 34a)

Legend

- Dunnage Disposal Site #1
- MEC Sighting
- Evidence of Munitions Use

MEC Presence*

- Known
- Suspect

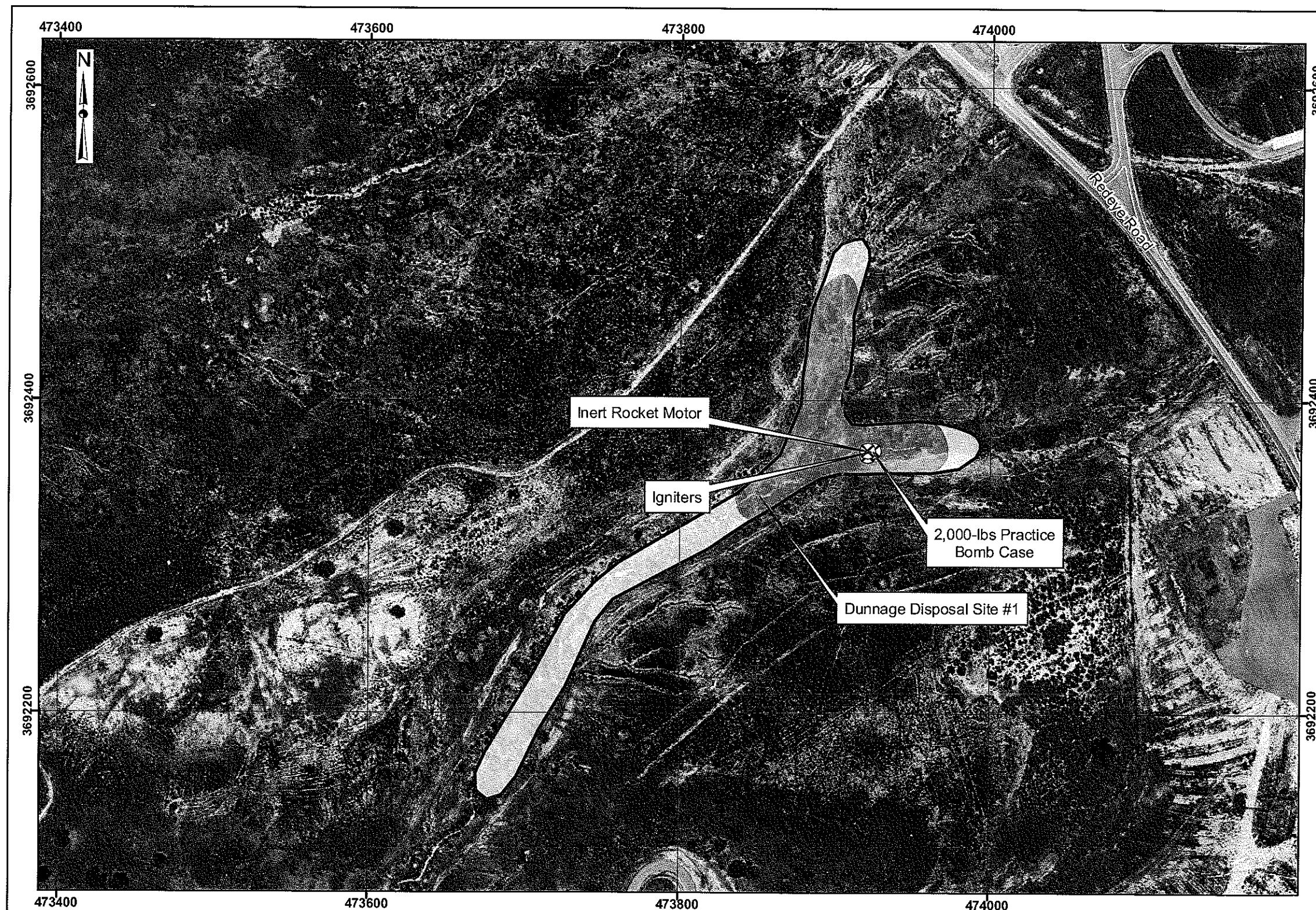
* MEC presence was determined through review of historical documentation, interviews, and visual survey.

0 75 150 Meters

Data Source: Anteon Corporation,
Ortho Photo, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
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5.5. Dunnage Disposal Site #2

The Dunnage Disposal Site #2 covers approximately 9 acres in the north central portion of the installation and is west of Walleye Road. Map 2 1-1 shows the location of the site on Detachment Fallbrook and its boundaries.

5.5.1. History and Site Description

The Dunnage Disposal Site #2 (IRP Site 34b) was in use from 1942 to 1978 as a disposal area for dunnage. The site is not currently in use. The Dunnage Disposal Site #2 was initially considered a possible munitions burial site because of evidence of MEC and munitions scrap that was found at two similar sites: Dunnage Disposal Site #1 and Dunnage Disposal Site #3. Investigation of the site and installation records, and many follow-up interviews, indicate that the Dunnage Disposal Site #2 was not a munitions burial site. Figure 5.5-1 shows a view of the Dunnage Disposal Site #2 looking north. No IRP investigations have been undertaken.



Figure 5.5-1: View of the Dunnage Disposal Site #2 looking north. Photograph was taken during the September 2004 on-site visual survey.

5.5.1.1. Topography

Dunnage Disposal Site #2 contains low hills. For further information on the topography of Detachment Fallbrook, see section 3.2.

5.5.1.2. Geology

The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information for the Dunnage Disposal Site #2 was not available. Section 3.3 includes a general description of the geology of Detachment Fallbrook.

5.5.1.3. Soil and Vegetation Types

Soils in the Dunnage Disposal Site #2 are classified as a sandy loam of granitic origin and are moderately well drained. Section 3.4 includes a general description of the soil types at Detachment Fallbrook.

The vegetation in the area of the Dunnage Disposal Site #2 is considered to be mostly coastal sage scrub. Common species in coastal sage scrub habitat include coastal sagebrush (*Artemisia californica*), flat-topped buckwheat (*Eriogonum fasciculatum*), laurel sumac (*Malosma laurina*), sage (*Salvia* spp.), goldenbush (*Isocoma menziesii*), and native grasses (*Nassella* spp.). Section 3.5 includes a general description of the vegetation types at Detachment Fallbrook.

5.5.1.4. Hydrology

The Dunnage Disposal Site #2 is located within the Santa Margarita watershed. There are no surface water bodies in the Dunnage Disposal Site #2. The Dunnage Disposal Site #2 drains primarily into Depot Lake, which is dammed, and into Fallbrook Creek. Section 3.6 includes a general description of the hydrology at Detachment Fallbrook.

5.5.1.5. Hydrogeology

No site-specific groundwater depth data were available. Section 3.7 includes a general description of the hydrogeology at Detachment Fallbrook.

5.5.1.6. Cultural and Natural Resources

The data collection team for the Dunnage Disposal Site #2 found no documentation of significant cultural resources at or near the site. Detachment Fallbrook has large areas of undisturbed land that can serve as suitable habitat to threatened and endangered species. Section 3.8 includes a general description of the cultural and natural resources at Detachment Fallbrook.

5.5.1.7. Endangered and Special Status Species

Threatened and endangered species data for Detachment Fallbrook are presented in Section 3.9. According to the California Wildlife and Habitat Analysis Branch, threatened and endangered species associated with the critical habitats of the former range that are known or have been documented within or adjacent to the Detachment Fallbrook are the coastal California gnatcatcher, Least Bell's vireo, and the Stephens' kangaroo rat

5.5.2. Visual Survey Observations and Results

The data collection team conducted a visual survey of the Dunnage Disposal Site #2 on September 28, 2004. Present during the visual survey were Mr. Chip Poalinelli, Mr. Al Larkins, and Mr. Scott Lehman. The following Navy representatives were present during the visual survey: Ms. Pei-Fen Tamashiro, Mr. Robbie Knight, and Mr. Si Le. The field team conducted the visual survey by walking 2/3 of the perimeter of the site. No evidence of MEC or munitions scrap was identified during the visual survey. There was a large quantity of non-munitions related trash at the site. Figure 5-2 shows a view of the non-munitions related trash at the site.



Figure 5.5-2: View of non-munitions related trash (tin cans and bottles) at Dunnage Disposal Site #2. Photograph was taken during the September 2004 on-site visual survey.

5.5.3. Munitions and Munitions Related Materials Associated with the Site

The Dunnage Disposal Site #2 is not suspected to contain MEC. The Dunnage Disposal Site #2 was initially considered a possible munitions burial site because of evidence of MEC and munitions scrap that was found at two similar sites: Dunnage Disposal Site #1 and Dunnage Disposal Site #3. Investigation of the site and the installation records, and many follow-up interviews, indicate that Dunnage Disposal Site #2 was not a munitions burial site.

5.5.4. MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence including: Known MEC Areas, Suspected MEC Areas, and Areas Not Suspected to Contain MEC to indicate that MEC is known or is suspected to be at the site. Map 5 5-3 illustrates the munitions characterization of the Dunnage Disposal Site #2, and is provided at the end of Section 5.5. The MEC presence is discussed below.

5.5.4.1. Known MEC Areas

There are no Known MEC Areas associated with the Dunnage Disposal Site #2 since no MEC was found onsite.

5.5.4.2. Suspected MEC Areas

There are no Suspected MEC Areas associated with the Dunnage Disposal Site #2. Since no MEC was found onsite and no MEC was disposed of at the site, it is not suspected that any MEC Areas exist at the Dunnage Disposal Site #2.

5.5.4.3. Areas Not Suspected to Contain MEC

Based upon observations made and data collected during the PA process, the Dunnage Disposal Site #2 is Not Suspected to Contain MEC.

5.5.5. Ordnance Penetration Estimates

MEC are not expected to be present at the site; therefore, penetration depths are not of concern.

5.5.6. Munitions Constituents

The Dunnage Disposal Site #2 is not suspected to contain MC.

5.5.7. Contaminant Migration Routes

MEC and MC are not expected to be present at the site; migration and release mechanisms are not of concern.

5.5.8. Receptors and Pathways

MEC and MC are not expected to be present at the site; potential receptors and pathways are not of concern.

5.5.8.1. Nearby Populations

Fallbrook and San Diego County have populations of 29,100, and 2,813,833, respectively (U.S. Census Bureau, 2000). The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. The Dunnage Disposal Site #2 is approximately 9,840 feet from the housing complex at the installation. See Section 2.1 for more information on the housing complex.

5.5.8.2. Buildings Near/Within Site

There are no buildings located on the site. Building 701 is located approximately 300 feet from the northern border of the site. Building 679 is located approximately 1,380 feet from the eastern border of the site. Both buildings are currently unused.

5.5.8.3. Utilities On/Near Site

No utilities were visible at the Dunnage Disposal Site #2. Within 0.2 miles to the east are phone lines and U.S. government phone lines.

5.5.9. Land Use

The Dunnage Disposal Site #2 is closed and is no longer used.

5.5.10. Access Controls / Restrictions

The Dunnage Disposal Site #2 is located on Detachment Fallbrook, which is a fenced and guarded installation. Security Forces are responsible for maintaining law and order and for implementing access control policies and procedures. The Dunnage Disposal Site #2 is also located within a restricted area guarded by the security force.

5.5.11. Conceptual Site Model

This CSM was developed following guidance documents issued by the USEPA for hazardous waste sites and the USACE for OE sites. Guidance documents included the USEPA’s Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA/540/G-89/004) and the Final USACE CSM Guidance Development of Integrated Conceptual Site Models for Environmental OE Sites (USACE, 2003)

The CSM describes the site and its environmental setting. The CSM presents information regarding: 1) MEC and/or MC known or suspected to be at the site; 2) current and future reasonably anticipated or proposed uses of the real property; and 3) actual, potentially complete, or incomplete exposure pathways that link MEC and/or MC to receptors.

The CSM is presented in a series of information profiles that provide information about the site. The information profiles are included in Table 5 5-1 below

Table 5.5-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #2		
Profile Type	Information Needs	Preliminary Assessment Findings
Site Profile	Installation Name	Detachment Fallbrook
	Installation Location	Detachment Fallbrook is located 53 miles north of San Diego in northern San Diego County, CA.
	Site Name	Dunnage Disposal Site #2 (IRP Site 34b)
	Site Location	The Dunnage Disposal Site #2 is in the north central portion of the installation, west of Walleye Road.
	Site History	The Dunnage Disposal Site #2 is a burial area for dunnage, used from 1942 until 1978. The Dunnage Disposal Site #2 was initially considered a possible munitions burial site because of evidence of MEC and munitions scrap that was found at two similar sites: Dunnage Disposal Site #1 and Dunnage Disposal Site #3. Investigation of the site and the installation records, and many follow-up interviews, indicate that Dunnage Disposal Site #2 was not a munitions burial site.
	Site Area and Layout	The Dunnage Disposal Site #2 is approximately 9 acres in size.
	Site Structures	There are no structures on the Dunnage Disposal Site #2.

Table 5.5-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #2		
Profile Type	Information Needs	Preliminary Assessment Findings
	Site Boundaries	<p>Map 2.1-1 shows the location of the Dunnage Disposal Site #2.</p> <p>N: The intersection of Walleye Road and Crossover Road is located approximately 900 feet north of the site</p> <p>S: Mixed grassland covers the area between the site and Sidewinder Road, which is approximately 1,700 feet south of the site</p> <p>W: Mixed grassland covers the area between the site and Depot Lake, approximately 1,650 feet west of the site.</p> <p>E: Coastal sage scrub stands between the site and Walleye Road, approximately 300 feet east of the site</p>
	Site Security	<p>The Dunnage Disposal Site #2 is located on Detachment Fallbrook, which is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order, and for implementing access control policies and procedures. The Dunnage Disposal Site #2 is also located within a restricted area guarded by the security force.</p>
Munitions/ Release Profile	Munitions Types	<p>The Dunnage Disposal Site #2 is not a suspected MEC area</p>
	Maximum Probability Penetration Depth	<p>MEC are not expected to be present at the Dunnage Disposal Site #2; therefore, penetration depths are not of concern.</p>
	MEC Density	<p>The Dunnage Disposal Site #2 is not suspected to contain MEC.</p>
	MEC Scrap/Fragments	<p>No evidence of MEC or munitions scrap was identified during the visual survey.</p>
	Associated Munitions Constituents	<p>The Dunnage Disposal Site #2 is not suspected to contain MC.</p>
	Migration Routes/Release Mechanisms	<p>MEC and MC are not expected to be present at the site; therefore, migration and release mechanisms are not of concern</p>

Table 5.5-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #2

Profile Type	Information Needs	Preliminary Assessment Findings
Physical Profile	Climate	The climate at Detachment Fallbrook is typical of the prevailing coastal southern California Mediterranean climate and is characterized by mild winters, cool summers, and infrequent rainfall. The annual average temperature is 63 °F. Precipitation ranges from 13.7 to 17.1 inches per year, with January being the wettest month and July the driest. Summers at the installation are punctuated by the Santa Ana (offshore) winds.
	Topography	The Dunnage Disposal Site #2 contains low hills.
	Geology	The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information was not available.
	Soil	The soil at the Dunnage Disposal Site #2 is classified as a sandy loam of granitic origin and is moderately well drained.
	Hydrogeology	No site-specific groundwater depth data were available.
	Hydrology	The Disposal Site #2 is within the Santa Margarita watershed. There are no surface water bodies in the Dunnage Disposal Site #2. The Dunnage Disposal Site #2 drains primarily into Depot Lake, which is dammed, and into Fallbrook Creek.
	Vegetation	The vegetation in the area of the Dunnage Disposal Site #2 is considered to be mostly coastal sage scrub. Common species in coastal sage scrub habitat include coastal sagebrush, flat-topped buckwheat, laurel sumac, sage, goldenbush, and native grasses.
Land Use and Exposure Profile	Current Land Use	The Dunnage Disposal Site #2 is closed and is no longer in use.
	Current Human Receptors	MEC and MC are not expected to be present at the site; potential receptors are not of concern.
	Current Activities (frequency, nature of activity)	Activities at the site may include environmental and ecological surveys.
	Potential Future Land Use	The Dunnage Disposal Site #2 was closed in 1978. There is no land use change planned.
	Potential Future Human Receptors	MEC and MC are not expected to be present at the site; potential receptors are not of concern.

Table 5.5-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #2		
Profile Type	Information Needs	Preliminary Assessment Findings
	Potential Future Land Use-Related Activities:	Any potential future land use activities would have to follow any Navy ESQD Arc waivers or exemptions. Other potential future activities at the site include environmental and ecological surveys.
	Zoning/Land Use Restrictions	Due to the proximity of the site to some of the installation's munitions storage bunkers, the site has ESQD Arc restrictions. The site is also listed as habitat for the coastal California gnatcatcher, which is a federally protected species.
	Demographics/Zoning	<p>The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. Demographic data include the following:</p> <ul style="list-style-type: none">• Town of Fallbrook: Population (U.S. Census, 2000): 29,100• San Diego County: Population (U.S. Census, 2000): 2,813,833
	Beneficial Resources	The coastal sage scrub and mixed grasslands habitats offer roosting and foraging resources for raptors.
Ecological Profile	Habitat Type	The Dunnage Disposal Site #2 contains coastal sage scrub habitat. The disposal area is within a zone designated as habitat for the federally endangered coastal California gnatcatcher.
	Degree of Disturbance	Current and anticipated future activities at the site, such as environmental and ecological surveys, may disturb habitat and/or ecological receptors known or potentially present within range areas.
	Ecological Receptors	
	General:	Common fauna included mammals (kangaroo rats, voles, deer, mice, ground squirrels, opossum, rabbits, and coyotes), amphibians (tree frogs), reptiles (orange-throated whiptails, rattlesnakes, and horned lizards), and birds (burrowing owls, kites, quails, sparrows, kingbirds, and hawks).
	Federal Endangered Species:	Least Bell's vireo and Stephens' kangaroo rat
	Federal Threatened Species:	Coastal California gnatcatcher

Table 5.5-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #2		
Profile Type	Information Needs	Preliminary Assessment Findings
	State Endangered Species:	Least Bell's vireo
	State Threatened Species:	Stephens' kangaroo rat
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	MEC and MC are not expected to be present at the site; therefore, relationship between sources and receptors are not of concern

MEC and MC exposure pathway analyses were not performed for the Dunnage Disposal Site #2 because MEC and MC are not anticipated at the site. No evidence was found to suggest that the site was ever used as a munitions burial site. No visual evidence of MEC was observed during the visual survey.

5.5.12. Summary

The Dunnage Disposal Site #2 (IRP Site 34b) covers approximately 9 acres in the north central portion of the installation and is west of Walleye Road. The Dunnage Disposal Site #2 was in use from 1942 to 1978 as a disposal area for dunnage. The site is not currently in use. No evidence of MEC or MC was found at the Dunnage Disposal Site #2. The Dunnage Disposal Site #2 was initially considered a possible munitions burial site because of the evidence of MEC and munitions scrap that was found at two similar sites: Dunnage Disposal Site #1 and Dunnage Disposal Site #3. Investigation of the site and the installation records, and many follow-up interviews, indicate that the Dunnage Disposal Site #2 was not a munitions burial site.

5.5.13. Recommendations

Based on the data collected and presented in this PA, NFA for MEC and MC is recommended at the Dunnage Disposal Site #2. Any further investigations at the site will be undertaken under the IRP.



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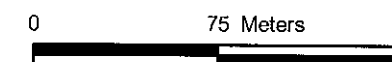
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Map 5.5-1
Visual Survey
Dunnage Disposal Site #2 (IRP Site 34b)

Legend

-  Dunnage Disposal Site #2*
 Site Reconnaissance Path

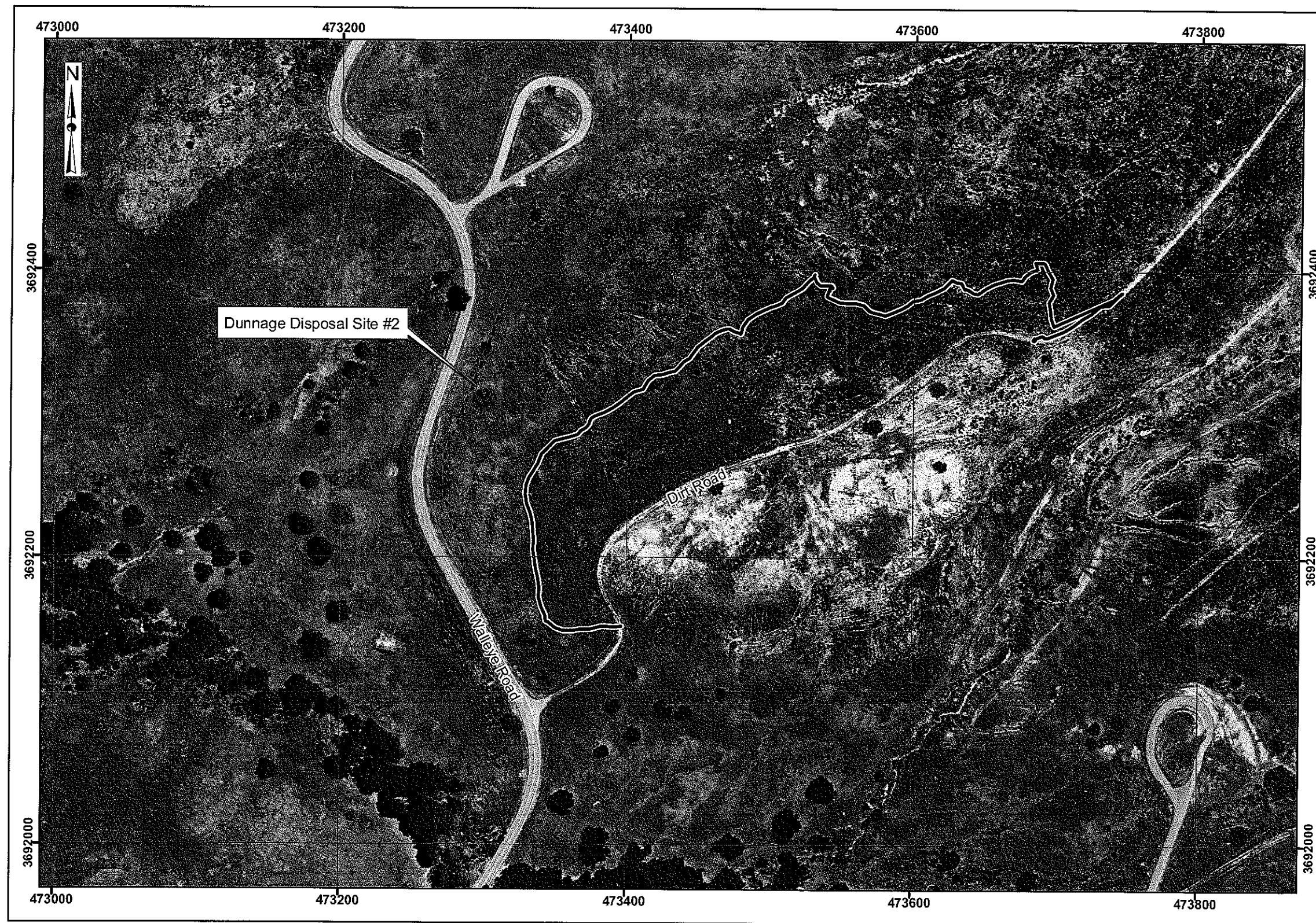
* Approximate boundary of the site.



Data Source: Anteon Corporation,
Orthophoto, June 3 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006



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Detachment Fallbrook, California



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Map 5.5-2
Site Details
Dunnage Disposal Site #2 (IRP Site 34b)

Legend

- Dunnage Disposal Site #2*
- Streams
- Topographic Contours (ft above MSL)
- Buildings

* Approximate boundary of the Site.

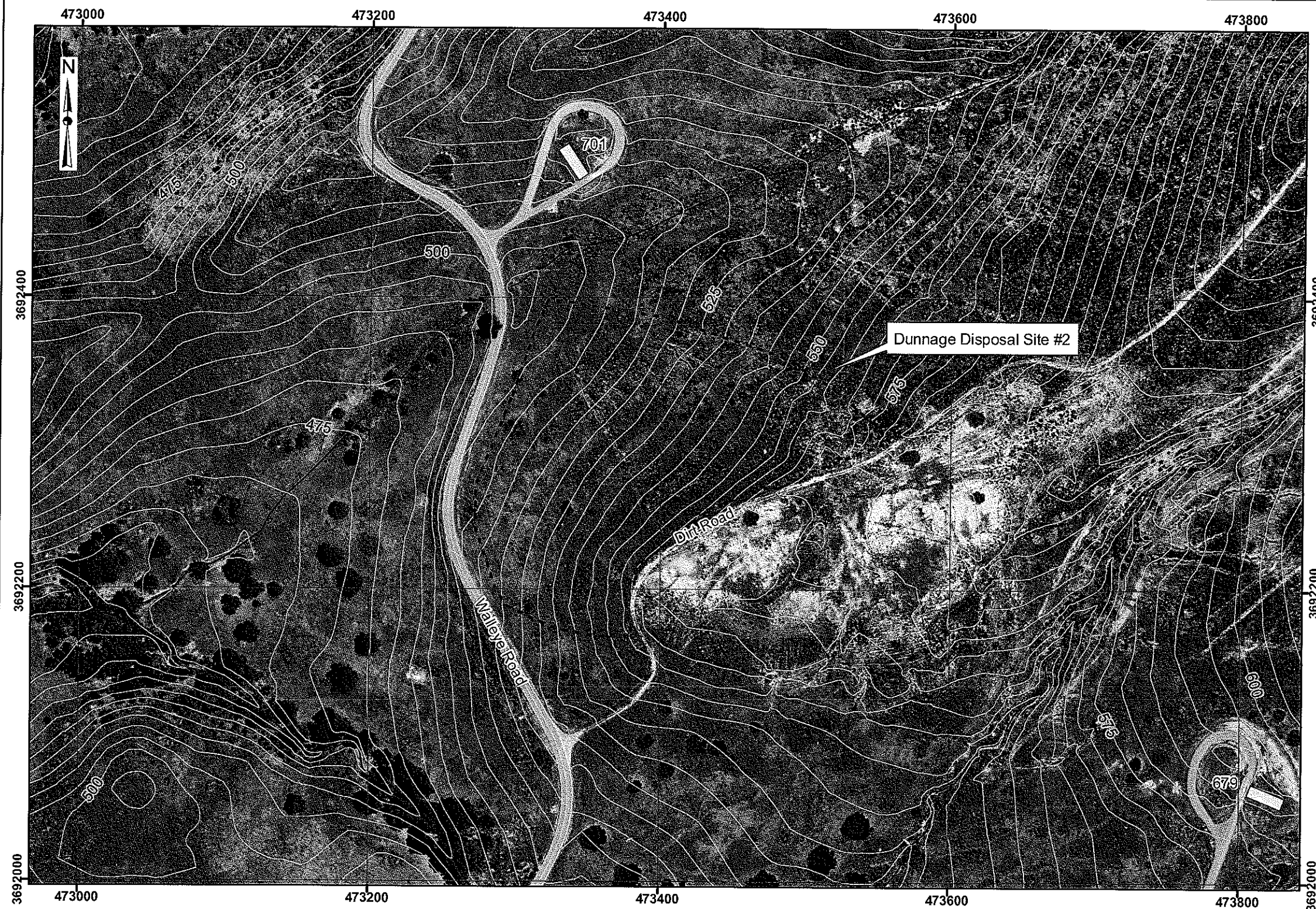
0 75 150 Meters

Data Source: Anteon Corporation,
Orthophoto, June 3, 2004
NAWPNSTA Seal Beach GIS Data,
Vector Contour Data

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

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Dunnage Disposal Site #2



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Map 5.5-3
Munitions Characterization
Dunnage Disposal Site #2 (IRP Site 34b)

Legend

Dunnage Disposal Site #2*

MEC Presence**

Known

Suspect

* Approximate boundary of the site.

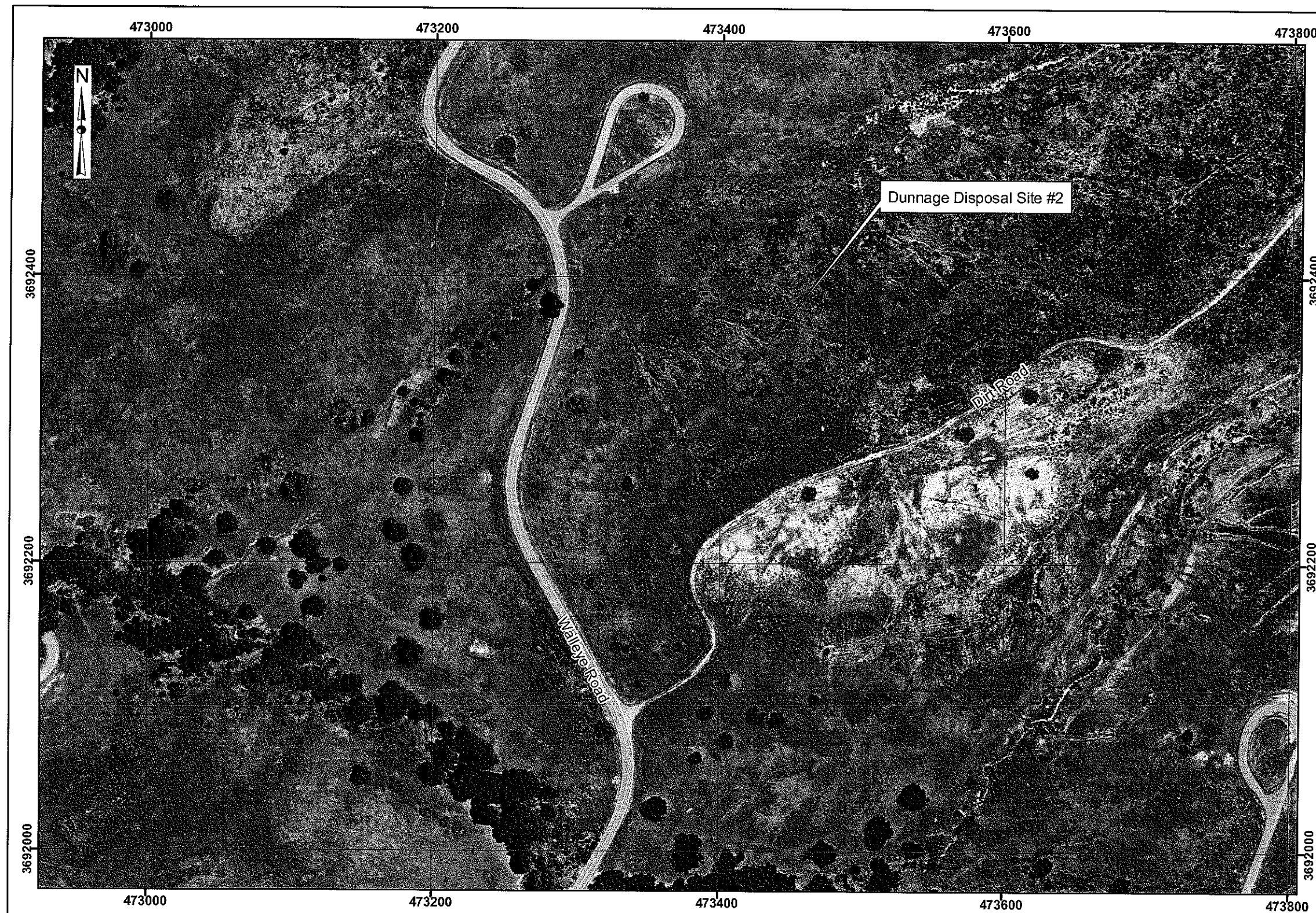
** There is no evidence of MEC presence as determined through historical documentation, interview, and visual survey.

0 75 150 Meters

Data Source: Anteon Corporation,
Orthophoto, June 3 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
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5.6. Dunnage Disposal Site #3

The Dunnage Disposal Site #3 covers approximately 1.5 acres south of Terriea Road in the central portion of Detachment Fallbrook. Map 2.1-1 shows the location of the site on Detachment Fallbrook and its boundaries.

5.6.1. History and Site Description

The Dunnage Disposal Site #3 (IRP Site 34c) is a potential munitions burial site. The area was used from 1942 to 1978 as a disposal area for dunnage. According to personnel interviews, the site was used as a disposal area for ordnance. A 1978 memorandum from Tom Curtis, a former Commanding Officer at Detachment Fallbrook, states that numerous cases of inert-rifle-propelled grenades were buried in the area. The area is not currently in use. There is no evidence of recent excavations or other intrusions that could have redistributed MEC and MC. Figure 5.5-1 shows a view of the site looking east. The Dunnage Disposal Site #3 was originally identified under the IRP as Site 34c, but is now being addressed under the MRP. No IRP investigations were undertaken.



Figure 5.6-1: View of the Dunnage Disposal Site #3 looking east. Photograph was taken during the September 2004 visual survey.

5.6.1.1. Topography

The Dunnage Disposal Site #3 is a ravine that leads to an intermittent stream. For further information on the topography of Detachment Fallbrook, see section 3.2.

5.6.1.2. Geology

The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information for the Dunnage Disposal Site #3 was not available. Section 3.3 includes a general description of the geology of Detachment Fallbrook.

5.6.1.3. Soil and Vegetation Types

Soils at the Dunnage Disposal Site #3 are classified as a coarse sandy loam of granitic origin and are moderately well drained. Section 3.4 includes a general description of the soil types at Detachment Fallbrook.

The vegetation in the area of the Dunnage Disposal Site #3 is considered to be mostly mixed grassland. Common species in mixed grassland habitat include native, perennial bunch grasses such as *Nassella* spp. mixed with nonnative annuals. Section 3.5 includes a general description of the vegetation types at Detachment Fallbrook.

5.6.1.4. Hydrology

The Dunnage Disposal Site #3 is within the Santa Margarita watershed. There are no surface water bodies in the Dunnage Disposal Site #3. The site drains primarily into Fallbrook Creek. Section 3.6 includes a general description of the hydrology at Detachment Fallbrook.

5.6.1.5. Hydrogeology

No site-specific groundwater depth data were available. Section 3.7 includes a general description of the hydrogeology at Detachment Fallbrook.

5.6.1.6. Cultural and Natural Resources

The data collection team for the Dunnage Disposal Site #3 found documentation of two significant cultural resources near the site. The cultural resources are both milling sites. To preserve the integrity of the cultural resources, more specific information is not included in this document. Detachment Fallbrook has large areas of undisturbed land that can serve as suitable

habitat to threatened and endangered species. Section 3.8 includes a general description of the cultural and natural resources at Detachment Fallbrook.

5.6.1.7. Endangered and Special Status Species

Threatened and endangered species data for Detachment Fallbrook are presented in Section 3.9. According to the California Wildlife and Habitat Analysis Branch, threatened and endangered species associated with the critical habitats of the site that is known or have been documented within or adjacent to the Detachment Fallbrook is the Stephens' kangaroo rat.

5.6.2. Visual Survey Observations and Results

The data collection team conducted a visual survey of the Dunnage Disposal Site #3 on September 28, 2004 and on March 8, 2005. During the visual surveys, the following Malcolm Pirnie team members were present: Mr. Chip Poalinelli, Mr. Al Larkins (September 2004), Mr. Dan Hains (March 2005), and Mr. Scott Lehman. The following Navy representatives were present during the September 2004 visual survey: Ms. Pei-Fen Tamashiro, Mr. Robbie Knight, and Mr. Si Le. The field team conducted the visual survey by walking the perimeter of the entire disposal site, then walking several transects of it. Inert rifle grenades, a 60-mm mortar, and other munitions scrap were observed on the ground surface and in the wash area during Malcolm Pirnie's site visits. There was also a large quantity of non-munitions related trash at the site. Figure 5.6-2 shows a view of rifle grenades discovered on the site during the September 2004 visual survey. A visual depiction of the site reconnaissance is provided on Map 5.6-1, at the end of Section 5.6. Additional site details are illustrated on Map 5.6-2, also at the end of Section 5.6.



Figure 5.6-2: View of rifle grenades discovered at Dunnage Disposal Site #3. Photograph was taken during the September 2004 visual survey.

5.6.3. Munitions and Munitions Related Materials Associated with the Site

This section describes the munitions or munitions related materials, including the types and estimated maximum penetration depths, known or suspected to be at the Dunnage Disposal Site #3. This includes both MEC and non-hazardous munitions related scrap (e.g., fragments, base plates, and inert mortar fins).

Inert rifle grenades and other munitions scrap were observed on the ground surface and in the wash area during Malcolm Pirnie's site visits. All interviews and documentation relating to the site indicated that only inert ordnance was buried there. One 60-mm mortar was observed on the surface of the site. There is a small possibility that other live ordnance was buried there, but this cannot be verified until an EOD technician checks each item buried at the site. The available technical data sheets on these items are included in Appendix D.

Based on the information obtained during the data collection process, Dunnage Disposal Site #3 is not suspected to contain CWM filled munitions, electrically fused munitions, or DU associated munitions.

5.6.4. MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence including: Known MEC Areas, Suspected MEC Areas, and Areas Not Suspected to Contain MEC.

to indicate that MEC is known or is suspected to be at the site. Map 5.6-3 illustrates the munitions characterization of the Dunnage Disposal Site #3, and is provided at the end of Section 5.6. The MEC presence is discussed below.

5.6.4.1. Known MEC Areas

There is a small Known MEC Area associated with the Dunnage Disposal Site #3 where the 60-mm mortar was observed on the surface of the site.

5.6.4.2. Suspected MEC Areas

The Dunnage Disposal Site #3 is a Suspected MEC Area, pending inspection of each ordnance item by an EOD technician to verify that it is inert.

5.6.4.3. Areas Not Suspected to Contain MEC

Based upon observations made and data collected during the PA process, the Dunnage Disposal Site #3 could have Areas Not Suspected to Contain MEC.

5.6.5. Ordnance Penetration Estimates

Munitions at the Dunnage Disposal Site #3 would be below the ground surface due to burial not penetration. The depth below ground surface would be dependent on the disposal site's construction.

5.6.6. Munitions Constituents

The MCs related to 60-mm mortars are black powder pellets, TNT, smoke mix, zinc oxide smoke, hexachloroethane smoke, aluminum powder, and RDX. There are no MCs related to inert rifle grenades. Based on discussions with installation personnel, surface soil sampling has not occurred.

5.6.7. Contaminant Migration Routes

For ordnance present at the Dunnage Disposal Site #3, migration of MEC and MC may occur through surface soil erosion, runoff, and by wind and dust generation. Future construction, excavation, and maintenance at the site are also potential release mechanisms for MEC and MC. MC in runoff could potentially end up in surface water or sediment. MC could also potentially leach through soils or surface waters to groundwater.

5.6.8. Receptors and Pathways

Potential human receptors at the Dunnage Disposal Site #3 include Navy personnel, visitors, and private contractors. Ecological receptors may come into direct contact with MC in soil while foraging or burrowing. Ecological receptors may also come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and prey). There is a potentially complete secondary pathway for the general public, who could come into contact with any MC that flow out of the installation through the surface water system.

5.6.8.1. Nearby Populations

Fallbrook and San Diego County have populations of 29,100, and 2,813,833, respectively (U.S. Census Bureau, 2000). The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. The Dunnage Disposal Site #3 is approximately 10,830 feet from the housing complex at the installation. See Section 2.1 for more information on the housing complex.

5.6.8.2. Buildings Near/Within Site

There are no buildings on or within a half-mile radius of the site.

5.6.8.3. Utilities On/Near Site

The only utilities on or near the site are U.S. government phone lines along the southern extent of the Dunnage Disposal Site #3.

5.6.9. Land Use

The Dunnage Disposal Site #3 is closed and is no longer used.

5.6.10. Access Controls / Restrictions

The Dunnage Disposal Site #3 is located on Detachment Fallbrook, which is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order and for implementing access control policies and procedures. The Dunnage Disposal Site #3 is also located within a restricted area guarded by the security force.

5.6.11. Conceptual Site Model

This CSM was developed following guidance documents issued by the USEPA for hazardous waste sites and the USACE for OE sites. Guidance documents included the USEPA’s Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA/540/G-89/004) and the Final USACE CSM Guidance Development of Integrated Conceptual Site Models for Environmental Ordnance and Explosives (OE) Sites (USACE, 2003)

The CSM describes the site and its environmental setting. The CSM presents information regarding: 1) MEC and/or MC known or suspected to be at the site; 2) current and future reasonably anticipated or proposed uses of the real property; and 3) actual, potentially complete, or incomplete exposure pathways that link MEC and/or MC to receptors.

The CSM is presented in a series of information profiles that provide information about the site. The information profiles are included in Table 5.6-1 below.

Table 5.6-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #3		
Profile Type	Information Needs	Preliminary Assessment Findings
Site Profile	Installation Name	Detachment Fallbrook
	Installation Location	Detachment Fallbrook is located 53 miles north of San Diego in northern San Diego County, CA.
	Site Name	Dunnage Disposal Site #3 (IRP Site 34c)
	Site Location	The Dunnage Disposal Site #3 is in the central portion of the installation, just south of Terriea Road.
	Site History	The Dunnage Disposal Site #3 is a burial area for dunnage and possibly for munitions, according to employee interviews. The site was used from 1942 until 1978. A 1978 memorandum from Tom Curtis, a former Commanding Officer at Detachment Fallbrook, states that numerous cases of inert-rifle-propelled grenades were buried in the area.
	Site Area and Layout	The Dunnage Disposal Site #3 occupies approximately 1.5 acres in a ravine between Terriea and Sidewinder Roads, which were constructed in 1945.
	Site Structures	There are no structures on the Dunnage Disposal Site #3.

Table 5.6-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #3		
Profile Type	Information Needs	Preliminary Assessment Findings
	Site Boundaries	Map 2 1-1 shows the location of the Dunnage Disposal Site #3 N: Terriea Road bounds the site to the north with magazine storage buildings beyond. S: Sidewinder Road bounds the site to the south with grassland beyond. W: Grassland bounds the site to the west. E: The intersection of Terriea and Sidewinder Roads borders the site to the east
	Site Security	The Dunnage Disposal Site #3 is located on Detachment Fallbrook, which is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order, and for implementing access control policies and procedures. The Dunnage Disposal Site #3 is also located within a restricted area guarded by the security force.
Munitions/ Release Profile	Munitions Types	The following munitions were observed during Malcolm Pirnie's site visit: inert rifle grenades, a 60-mm mortar, and other munitions scrap. All interviews and documentation relating to the site indicated that only inert ordnance was buried at the site. There is a possibility that other live ordnance are buried at the site.
	Maximum Probability Penetration Depth	Munitions at the Dunnage Disposal Site #3 would be below surface because of burial and not penetration. The depth of MEC would depend on the construction of the disposal site.
	MEC Density	The Dunnage Disposal Site #3 has a small Known MEC Area and the rest of the site is a Suspected MEC area. The site is suspected to have a low MEC density.
	MEC Scrap/Fragments	The following munitions scrap was observed during Malcolm Pirnie's site visit: inert rifle grenades and other munitions scrap.

Table 5.6-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #3

Profile Type	Information Needs	Preliminary Assessment Findings
	Associated Munitions Constituents	<p>There are no MC concerns related to the inert rifle grenades. The primary MC for the live ordnance at the site and if any of the rifle grenades are live are:</p> <ul style="list-style-type: none">○ 60-mm mortars: RDX, black powder pellets, zinc oxide smoke, hexachloroethane smoke, aluminum powder, and TNT; and○ Rifle grenades: TNT, RDX, zinc oxide smoke, hexachloroethane smoke, aluminum powder, white phosphorus, potassium chlorate, colored smoke, and PETN.
	Migration Routes/Release Mechanisms	<p>Migration of MEC and MC may occur through surface soil erosion, runoff, and by wind and dust generation. Future construction, excavation, and maintenance at the site are also potential release mechanisms. MC in runoff could potentially end up in surface water or sediment. MC could also potentially leach through soils or surface waters to groundwater.</p>
Physical Profile	Climate	<p>The climate at Detachment Fallbrook is typical of the prevailing coastal southern California Mediterranean climate and is characterized by mild winters, cool summers, and infrequent rainfall. The annual average temperature is 63 °F. Precipitation ranges from 13.7 to 17.1 inches per year, with January being the wettest month and July the driest. Summers at the installation are punctuated by the Santa Ana (offshore) winds.</p>
	Topography	<p>The Dunnage Disposal Site #3 is a drainage area that leads to an intermittent stream.</p>
	Geology	<p>The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information was not available.</p>
	Soil	<p>The soil at the Dunnage Disposal Site #3 is classified as a coarse sandy loam of granitic origin and is moderately well drained.</p>
	Hydrogeology	<p>No site-specific groundwater depth data were available.</p>

Table 5.6-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #3

Profile Type	Information Needs	Preliminary Assessment Findings
	Hydrology	The Dunnage Disposal Site #3 is within the Santa Margarita watershed. There are no surface water bodies in the Dunnage Disposal Site #3. The central plateau of the installation, where the Dunnage Disposal Site #3 is located, drains primarily into Fallbrook Creek.
	Vegetation	The vegetation in the area of the Dunnage Disposal Site #3 is considered to be mostly Mixed Grassland. Common species in Mixed Grassland habitat include native, perennial bunch grasses such as Nassella spp. mixed with nonnative annuals.
Land Use and Exposure Profile	Current Land Use	The Dunnage Disposal Site #3 is closed and is no longer in use.
	Current Human Receptors	Navy personnel and Navy-permitted visitors (including contractors). There is also a potentially complete exposure pathway for the general public coming into contact with MC migrating off the installation through the surface water system
	Current Activities (frequency, nature of activity)	Activities at the site may include environmental and ecological surveys
	Potential Future Land Use	The Dunnage Disposal Site #3 was closed in 1978. There is no change in land use planned.
	Potential Future Human Receptors	Navy personnel and Navy-permitted visitors (including contractors). There is also a potentially complete exposure pathway for the general public coming into contact with MC migrating off the installation through the surface water system.
	Potential Future Land Use-Related Activities:	Any potential future land use activities would have to follow any Navy ESQD Arc waivers or exemptions. Other potential future activities at the site include environmental and ecological surveys
	Zoning/Land Use Restrictions	Due to the proximity of the site to some of the installation's munitions storage bunkers, ESQD Arc restrictions apply to this site. The site is also listed as habitat for the Stephens' kangaroo rat, which is a federally protected species.

Table 5.6-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #3		
Profile Type	Information Needs	Preliminary Assessment Findings
Ecological Profile	Demographics/Zoning	<p>The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. Demographic data include the following:</p> <ul style="list-style-type: none">• Town of Fallbrook: Population (U S. Census, 2000): 29,100• San Diego County: Population (U S Census, 2000): 2,813,833
	Beneficial Resources	Mixed grasslands habitats offer roosting and foraging resources for raptors
	Habitat Type	The Dunnage Disposal Site #3 contains mixed grasslands habitat. The area is also in a zone designated as habitat for the federally endangered Stephens' kangaroo rat.
	Degree of Disturbance	Current and anticipated future activities at the site, such as environmental and ecological surveys, may disturb habitat and/or ecological receptors known or potentially present within range areas.
	Ecological Receptors	
	General:	Common fauna included mammals (kangaroo rats, voles, deer, mice, ground squirrels, opossum, rabbits, and coyotes), amphibians (tree frogs), reptiles (orange-throated whiptails, rattlesnakes, and horned lizards), and birds (burrowing owls, kites, quails, sparrows, kingbirds, and hawks).
	Federal Endangered Species:	Stephens' kangaroo rat
	State Threatened Species:	Stephens' kangaroo rat

Table 5.6-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #3		
Profile Type	Information Needs	Preliminary Assessment Findings
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	Potential human receptors at the site include Navy personnel, visitors, and private contractors. Ecological receptors may come into direct contact with MEC and/or MC in surface and/or subsurface soil while foraging or burrowing. Ecological receptors may also come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and prey). There is also a potentially complete exposure pathway for the general public coming into contact with MC migrating off the installation through the surface water system.

A key element of the CSM is the exposure pathway analysis, which is performed separately for MEC and for MC.

For MEC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MEC are expected to be found); 2) access (e.g., controlled or uncontrolled access, items on the surface or within the subsurface); 3) an activity (e.g., non-intrusive grounds maintenance or intrusive construction); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, authorized visitors, or ecological receptors). It is important to recognize that environmental mechanisms (e.g., erosion) and/or human intervention may result in the repositioning of MEC.

For MC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MC are expected to be found); 2) an exposure medium (e.g., surface soil); 3) an exposure route (e.g., dermal contact); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, authorized visitors, or ecological receptors). If the point of exposure is not at the same location as the source, the pathway may also include a release mechanism (e.g., volatilization) and a transport medium (e.g., air).

The potential interactions between the source and receptors are assessed differently between MEC and MC. For MC, interaction between the source and receptors involves a release mechanism for the MC, an exposure medium that contains the MC, and an exposure route that places the receptor into contact with the contaminated medium. For MEC, interaction between

the potential receptors and an MEC source has two components. The receptor must have access to the source and must engage in some activity that results in contact with individual MEC items within the source area.

MEC Interactions and Pathway Analysis

The exposure pathway analysis for MEC is shown in Figure 5.6-3; Dunnage Disposal Site #3 is suspected to contain MEC. Historical and visual evidence indicate that there is a low incidence of MEC on the surface at the Dunnage Disposal Site #3. A 60-mm mortar and inert rifle grenades were observed on the surface and are likely to be present in the subsurface at the site. There is a small possibility that some of the ordnance is still live, which is why the majority of the site is labeled a suspected MEC area. The release mechanism of handling/treading underfoot activities creates a complete pathway for all human receptors and biota (wildlife) for MEC on the surface of the site. The release mechanism of intrusive activities (such as digging or drilling) could create a potentially complete pathway for Navy personnel and contractors and ecological receptors both for MEC on the surface and subsurface at the site.

MC Interactions and Pathway Analysis

The exposure pathway analysis for MC is shown in Figure 5.6-4. Potential receptors include both human (Navy personnel and contractor/visitor) and ecological receptors (biota) that may come in contact with MC in the source medium or other potentially contaminated media. Pathways are shown for each medium and are discussed below. For MC, interaction between the source (e.g., burial pits) and receptors generally involves a release mechanism for the MC (e.g., runoff to surface water and uptake into the food chain), an exposure medium containing the MC (e.g., soil, surface water, and sediment), and an exposure route (e.g., incidental ingestion and dermal contact) that places the receptor into contact with the contaminated medium.

Surface Water/Sediment

As discussed earlier, Dunnage Disposal Site #3 is a ravine and drains towards Fallbrook Creek, so MC are available to receptors in surface water or sediment. The pathway for surface water and/or sediment is considered potentially complete for all receptors. There is a potentially complete pathway for the general public for any MC that flows out of the installation through the surface water system.

Plant/Animal Uptake

Potentially complete pathways are indicated for biota (wildlife) exposed to MC at the Dunnage Disposal Site #3 via the food chain. MC may be taken up by plants and prey and consumed by animals at the disposal site.

Surface Soil

Potentially complete pathways exist for all receptors (except for the general public) via all exposure routes for surface soil contaminated with MC at the Dunnage Disposal Site #3. It is suspected that MC resides in the surface soil (i.e., 0 to 2 feet below ground surface). Inhalation exposures to humans or biota from inhalation of dust are anticipated, due to the low vegetative cover on the existing soils and the dry climate. Any future movement or grading of surface soils could make MC available for wind distribution and subsequent inhalation.

Subsurface Soil

Potentially complete subsurface soil pathways are expected to exist for all receptors (except for the general public) via all exposure routes at the Dunnage Disposal Site #3. The pathways are considered to be potentially complete for biota and for Navy personnel and contractors. Biota might come into contact with the contaminated soil by burrowing and/or ingesting. Navy personnel and contractors might engage in excavation or drilling activities, which could make it possible for receptors to come into contact with MC in subsurface soil.

Groundwater

Potentially complete pathways for Navy personnel and contractors/visitors are indicated for groundwater contaminated with MC at the Dunnage Disposal Site #1. Navy personnel and contractors/visitors may come into contact with groundwater during environmental investigations (i.e., monitoring well installation and sampling) at the former site. The potential for groundwater impacts is considered to be incomplete for all other receptors.

An exposure pathway does not exist for MC volatilizing into the air for all receptors.

5.6.12. Summary

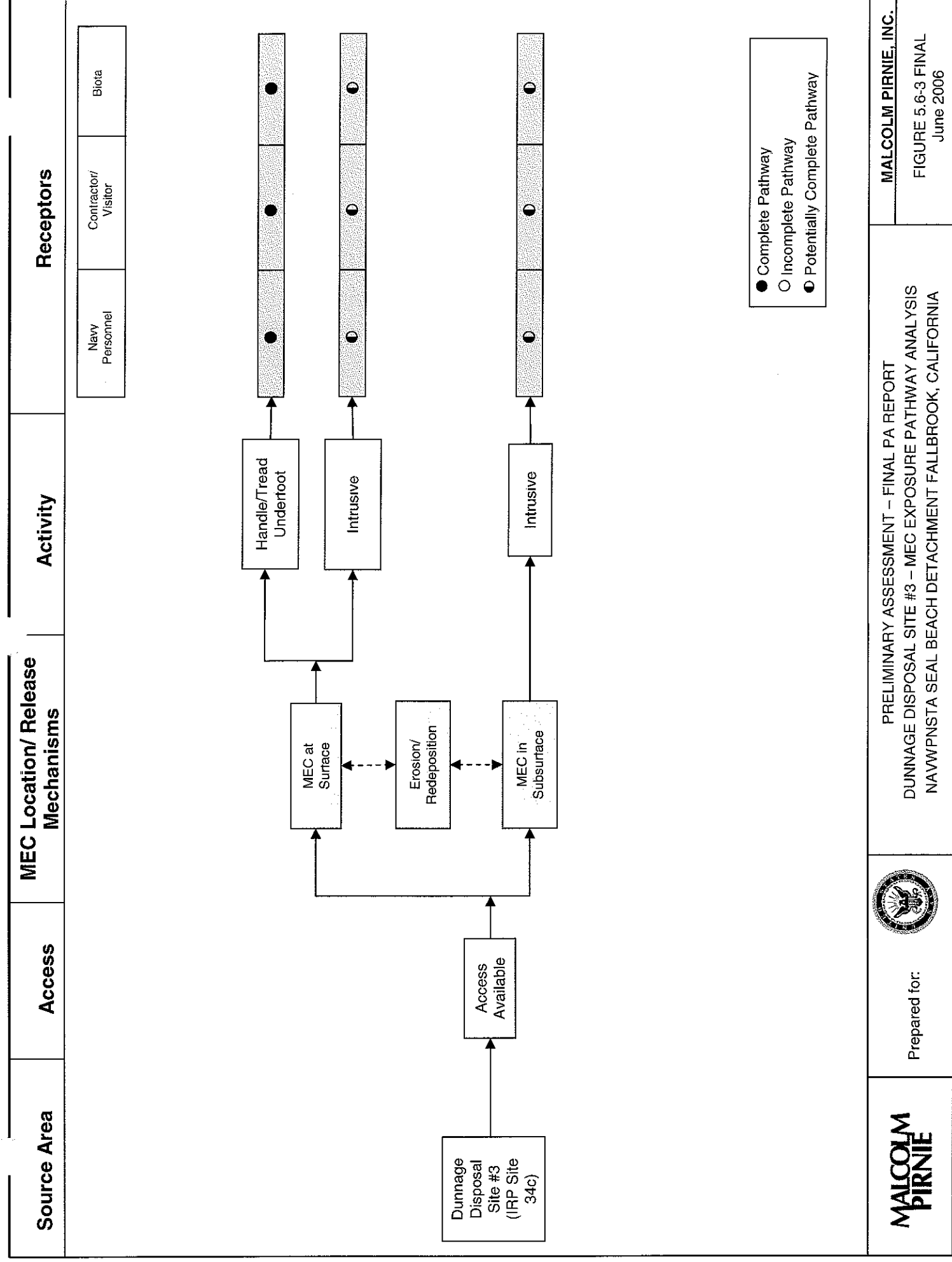
The 1.5-acre Dunnage Disposal Site #3 (IRP Site 34c) is located south of Terriea Road in the central portion of Detachment Fallbrook. The Dunnage Disposal Site #3 is a munitions burial site. The area was used from 1942 to 1978 as a disposal area for dunnage. According to personnel interviews, the site was used as a disposal area for ordnance. A 1978 memorandum

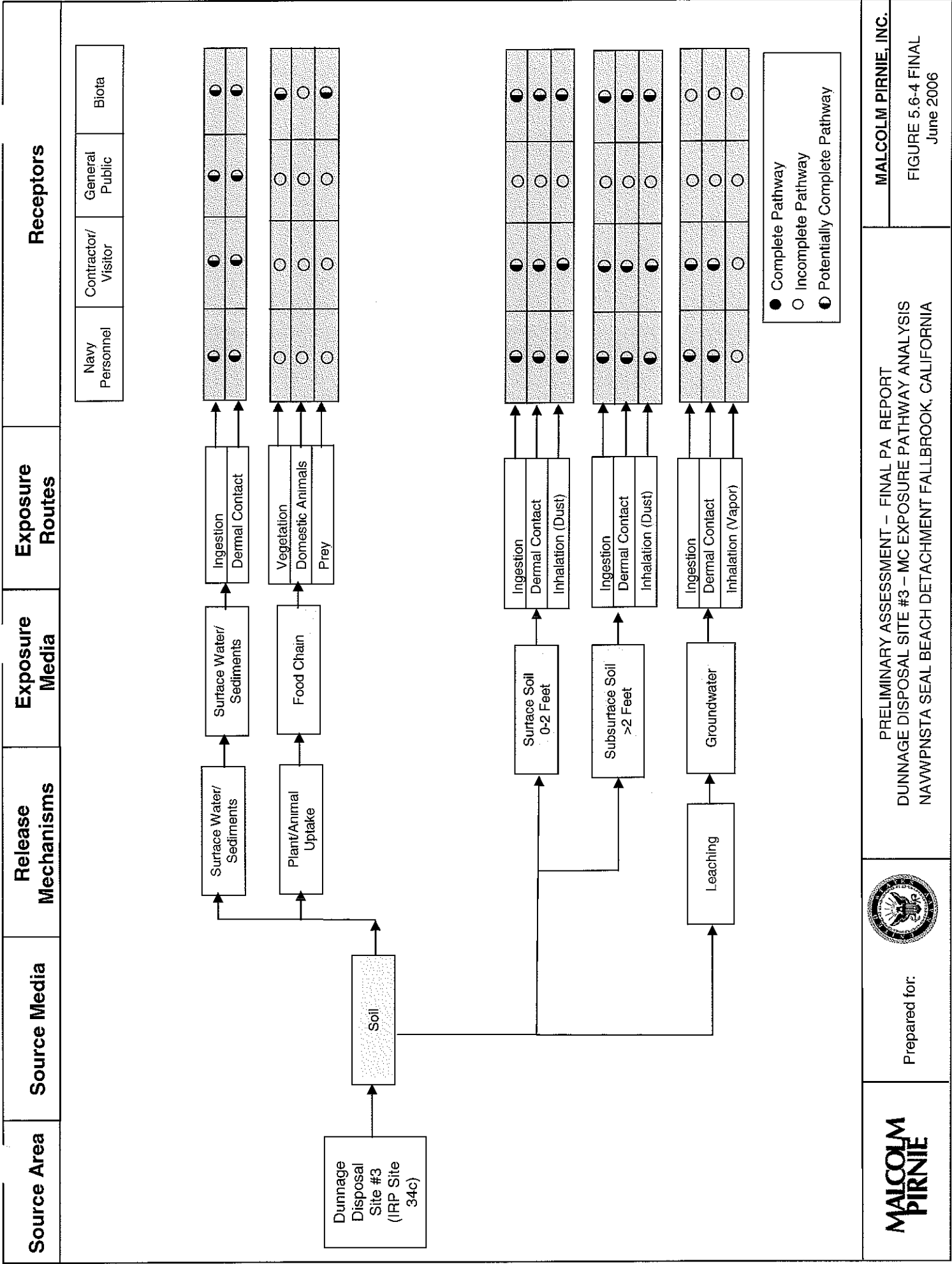
FINAL PRELIMINARY ASSESSMENT

from Tom Curtis, a former Commanding Officer at Detachment Fallbrook, states that numerous cases of inert-rifle-propelled grenades were buried in the area. Inert rifle grenades and other munition scrap were observed on the ground surface and in the wash area during Malcolm Pirnie's site visits. All interviews and documentation relating to the site indicated that only inert ordnance was buried there. One 60-mm mortar was observed on the surface of the site. There is a possibility that other live ordnance was buried there. The area is not currently in use.

5.6.13. Recommendations

Based on the data collected and presented in this PA, an SI is recommended for both MEC and MC at the Dunnage Disposal Site #3. The SI activities should focus on determining the extent of MEC and MC at the site. During the SI, it is recommended that surface and subsurface soil samples be collected from the site and analyzed for ordnance residuals and metals. Performing a geophysical survey at the site will help determine the extent of MEC at the site. It is also recommended that a groundwater monitoring well be installed to verify that the groundwater under the site has not been affected. If intrusive activities are planned for the site, the potential receptors should be made aware that the site was a munitions burial site.





Prepared for:



PRELIMINARY ASSESSMENT – FINAL PA REPORT
DUNNAGE DISPOSAL SITE #3 – MC EXPOSURE PATHWAY ANALYSIS
NAVWPNSTA SEAL BEACH DETACHMENT FALLBROOK, CALIFORNIA

MALCOLM PIRNIE, INC.

FIGURE 5.6-4 FINAL
June 2006



Preliminary Assessment
NAWPNSTA Seal Beach
Detachment Fallbrook, California




MALCOLM
PIRNIE

Map 5.6-1
Visual Survey
Dunnage Disposal Site #3 (IRP Site 34c)

Legend

-  Dunnage Disposal Site #3
-  Site Reconnaissance Path

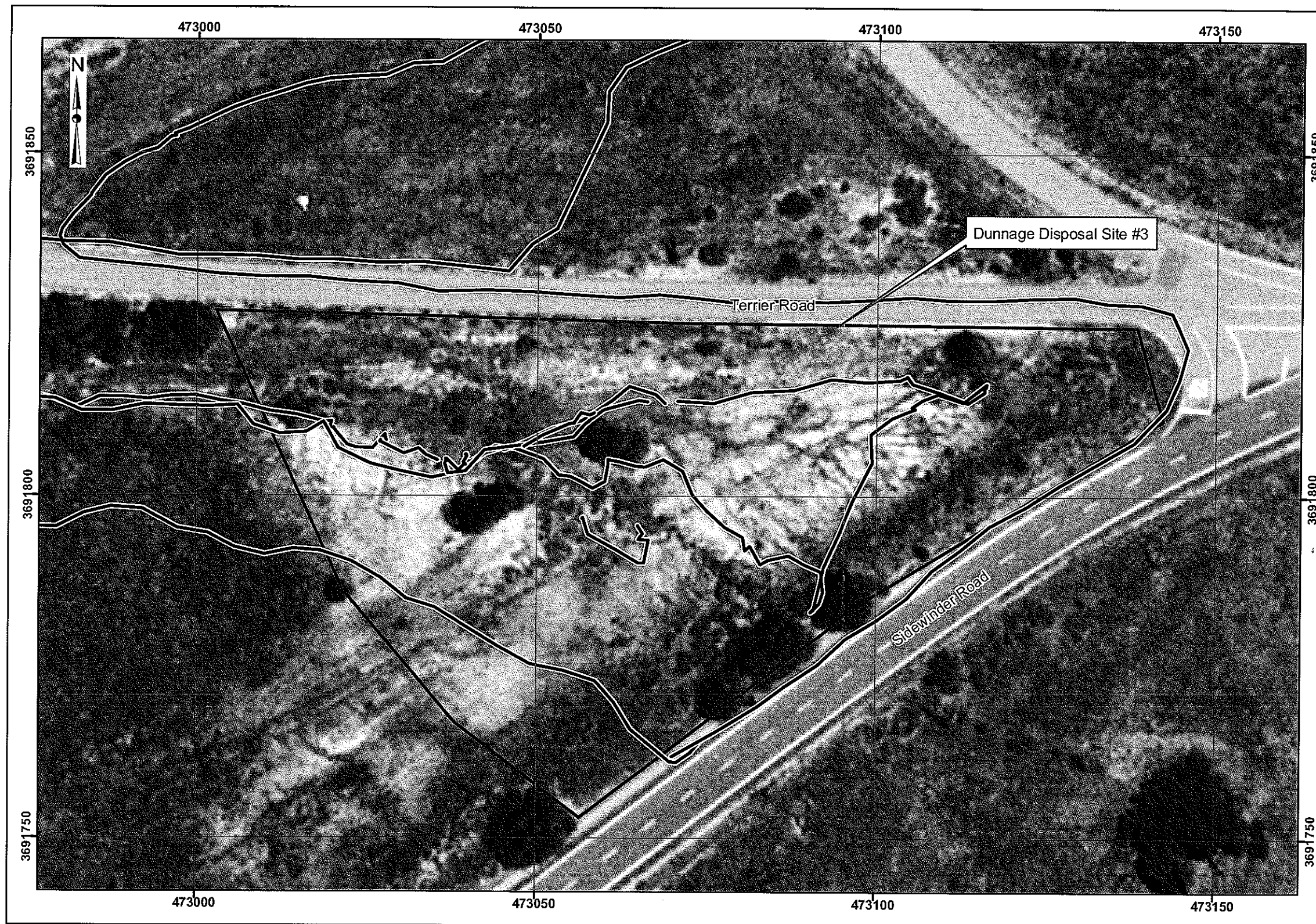
0 15 30 Meters



Data Source: Anteon Corporation,
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006






Preliminary Assessment
NAWPNSTA Seal Beach
Detachment Fallbrook, California




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Map 5.6-2
Site Details
Dunnage Disposal Site #3 (IRP Site 34c)

Legend

-  Dunnage Disposal Site #3
-  Streams
-  Topographic Contours (ft above MSL)

0 15 30 Meters

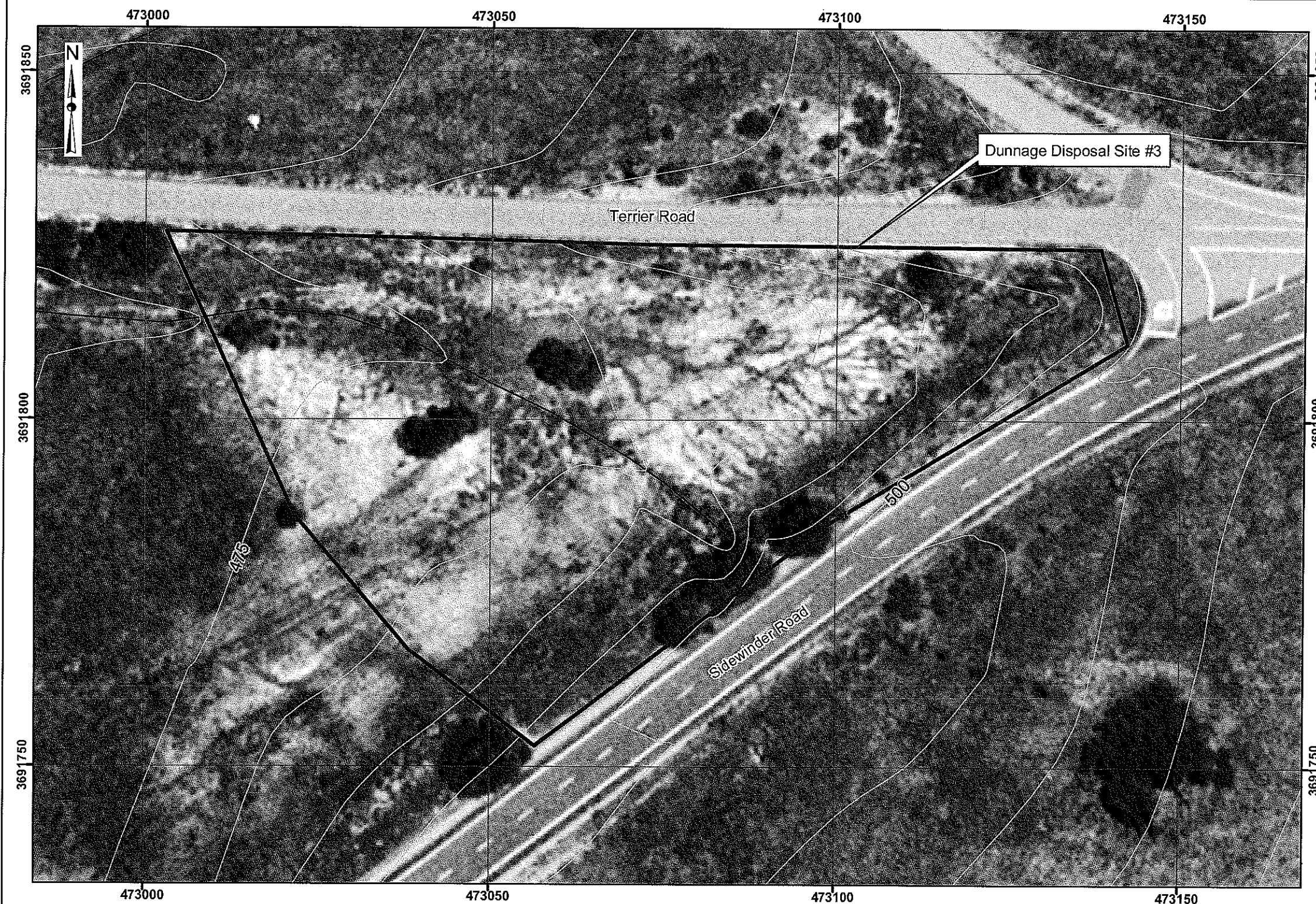


Data Source: Anteon Corporation,
Orthophoto, June 3, 2004
NAWPNSTA Seal Beach GIS Data,
Vector Contour Data

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006

NAWPNSTA Seal Beach
Detachment Fallbrook, California
Dunnage Disposal Site #3



Preliminary Assessment
NAWPNSTA Seal Beach
Detachment Fallbrook, California



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Map 5.6-3
Munitions Characterization
Dunnage Disposal Site #3 (IRP Site 34c)

Legend

Dunnage Disposal Site #3

MEC Sighting

Evidence of Munitions Use

MEC Presence*

Known

Suspect

RPG - Rifle Propelled Grenade

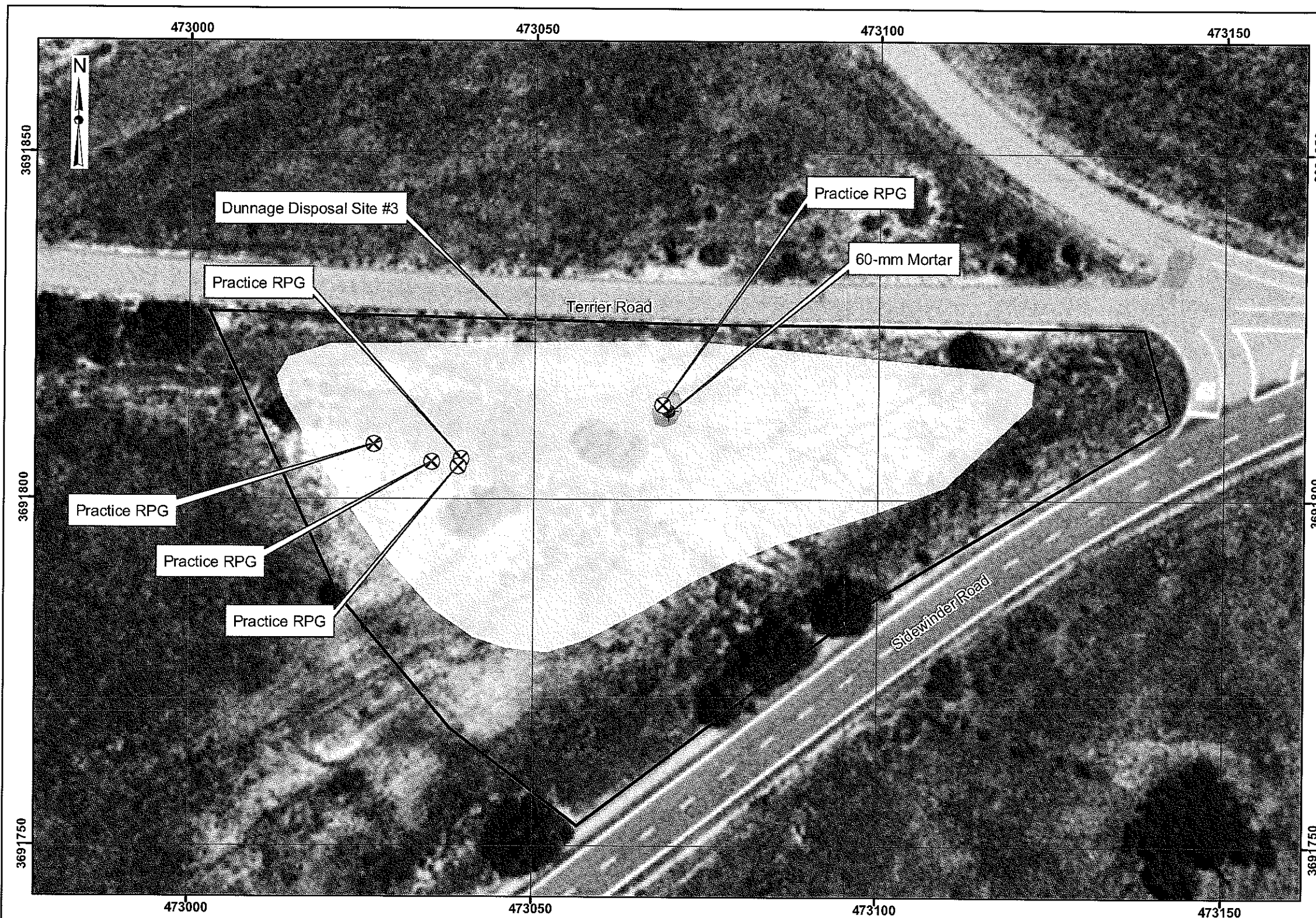
* MEC presence was determined
through review of historical documentation,
interviews, and visual survey.

0 15 Meters

Data Source: Anteon Corporation,
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006



5.7. Dunnage Disposal Site #4

The Dunnage Disposal Site #4 covers approximately 1.8 acres west of Building 388 in the central portion of Detachment Fallbrook. Map 2.1-1 shows the location of the site on Detachment Fallbrook and its boundaries.

5.7.1. History and Site Description

The Dunnage Disposal Site #4 (IRP Site 34d) was used from 1942 to 1978 as a disposal area for dunnage. The area is not currently in use. The Dunnage Disposal Site #4 was initially considered a possible munitions burial site because of the evidence of MEC and munitions scrap that was found at two similar sites: Dunnage Disposal #1 and Dunnage Disposal Site #3. Investigation of the site and the installation records, and many follow-up interviews, indicate that Dunnage Disposal #4 was not a munitions burial site. The remnant foundation of what may once have been Building 338 remains on the site. Figure 5.7-1 shows a view of the building foundation at the site. No IRP investigations have been undertaken.



Figure 5.7-1: View of the building foundation at Dunnage Disposal Site #4. Photograph was taken during the March 2005 visual survey.

5.7.1.1. Topography

The Dunnage Disposal Site #4 has low hills. For further information on the topography of Detachment Fallbrook, see section 3.2.

5.7.1.2. Geology

The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information for the Dunnage Disposal Site #4 was not available. Section 3.3 includes a general description of the geology of Detachment Fallbrook.

5.7.1.3. Soil and Vegetation Types

Soils in the Dunnage Disposal Site #4 are classified as a sandy loam of granitic origin and are moderately well drained. Section 3.4 includes a general description of the soil types at Detachment Fallbrook.

The vegetation in the area of the Dunnage Disposal Site #4 is mostly riparian with some coastal sage scrub and eucalyptus forest. Common species in coastal sage scrub habitat include coastal sage brush (*Artemisia californica*), flat-topped buckwheat (*Eriogonum fasciculatum*), laurel sumac (*Malosma laurina*), sage (*Salvia* spp.), goldenbush (*Isocoma menziesii*), and native grasses (*Nassella* spp.). Common species in riparian habitat include mulefat (*Baccharis salicifolia*), arroyo willows (*Salix lasiolepis*), and elderberry (*Sambucus mexicana*). Section 3.5 includes a general description of the vegetation types at Detachment Fallbrook.

5.7.1.4. Hydrology

Dunnage Disposal Site #4 is in the Santa Margarita watershed. There are no surface water bodies in the Dunnage Disposal Site #4, but the site drains towards Fallbrook Creek. Section 3.6 includes a general description of the hydrology at Detachment Fallbrook.

5.7.1.5. Hydrogeology

No site-specific groundwater depth data were available. Section 3.7 includes a general description of the hydrogeology at Detachment Fallbrook.

5.7.1.6. Cultural and Natural Resources

The data collection team for the Dunnage Disposal Site #4 found no documentation of significant cultural resources at or near the site. Detachment Fallbrook has large areas of undisturbed land that can serve as suitable habitat to threatened and endangered species. Section 3.8 includes a general description of the cultural and natural resources at Detachment Fallbrook.

5.7.1.7. Endangered and Special Status Species

Threatened and endangered species data for Detachment Fallbrook are presented in Section 3.9. According to the California Wildlife and Habitat Analysis Branch, threatened and endangered species associated with the critical habitats of the former range that are known or have been documented within or adjacent to the Detachment Fallbrook are the Least Bell's vireo, Stephens' kangaroo rat, Arroyo toad, and the Southwestern willow flycatcher.

5.7.2. Visual Survey Observations and Results

The data collection team conducted a visual survey of the Dunnage Disposal Site #4 on March 9, 2005. Malcolm Pirnie representatives participating in the visual survey were Mr. Chip Poalinelli, Mr. Dan Hains, and Mr. Scott Lehman. The field team conducted the visual survey by walking the perimeter of the entire site, then walking several transects across the site. The limited visual survey of the area by the data collection team revealed no evidence of MEC or munitions scrap except for an empty ammunition canister. The canister appeared to have washed into the area due to runoff and did not appear to be related to disposal activities at the site. There was construction debris and non-munitions related trash at the site. The remnant foundation of what may once have been Building 338 remains on the site. Figure 5.7-2 shows a view of the wash and the empty canister. A visual depiction of the site reconnaissance is provided on Map 5.7-1 located at the end of Section 5.7. Additional site details are illustrated on Map 5.7-2 also located at the end of Section 5.7.



Figure 5.7-2: View of wash. Photograph was taken during the March 2005 visual survey.

5.7.3. Munitions and Munitions Related Materials Associated with the Site

The Dunnage Disposal Site #4 is not suspected to contain MEC. The Dunnage Disposal Site #4 was initially considered a possible munitions burial site because of the evidence of MEC and munitions scrap that was found at two similar sites: Dunnage Disposal #1 and Dunnage Disposal Site #3. Investigation of the site and the installation records, and many follow-up interviews, indicate that the Dunnage Disposal #4 was not a munitions burial site.

5.7.4. MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence including: Known MEC Areas, Suspected MEC Areas, and Areas Not Suspected to Contain MEC to indicate that MEC is known or is suspected to be at the site. Map 5.7-3 illustrates the munitions characterization of the Dunnage Disposal Site #4, and is provided at the end of Section 5.7. The MEC presence is discussed below

5.7.4.1. Known MEC Areas

There are no Known MEC Areas associated with the Dunnage Disposal Site #4.

5.7.4.2. Suspected MEC Areas

There are no Suspected MEC Areas associated with the Dunnage Disposal Site #4 since MEC was not disposed of at the site

5.7.4.3. Areas Not Suspected to Contain MEC

Based upon observations made and data collected during the PA process, the Dunnage Disposal Site #4 is Not Suspected to Contain MEC.

5.7.5. Ordnance Penetration Estimates

MEC and MC are not expected to be present at the site; penetration depths are not of concern.

5.7.6. Munitions Constituents

The Dunnage Disposal Site #4 is not suspected to contain MC.

5.7.7. Contaminant Migration Routes

MEC and MC are not expected to be present at the site; migration and release mechanisms are not of concern.

5.7.8. Receptors and Pathways

MEC and MC are not expected to be present at the site; potential receptors and pathways are not of concern.

5.7.8.1. Nearby Populations

Fallbrook and San Diego County have populations of 29,100, and 2,813,833, respectively (U.S. Census Bureau, 2000). The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. The Dunnage Disposal Site #4 is approximately 11,150 feet from the housing complex at the installation. See Section 2.1 for more information on the housing complex.

5.7.8.2. Buildings Near/Within Site

The remnant foundation of what may once have been Building 338 remains on the site. It is not clear what the former use of the building was. There are no buildings within 0.5 miles of the Dunnage Disposal Site #4.

5.7.8.3. Utilities On/Near Site

There are no utilities on the Dunnage Disposal Site #4. Phone lines are within 0.1 miles to the south and west of the Dunnage Disposal Site #4.

5.7.9. Land Use

The Dunnage Disposal Site #4 is closed and is no longer used for disposal.

5.7.10. Access Controls / Restrictions

The Dunnage Disposal Site #4 is located on Detachment Fallbrook, which is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order and for implementing access control policies and procedures. The Dunnage Disposal Site #4 is also located within a restricted area guarded by the security force.

5.7.11. Conceptual Site Model

This CSM was developed following guidance documents issued by the USEPA for hazardous waste sites and the USACE for OE sites. Guidance documents included the USEPA’s Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA/540/G-89/004) and the Final USACE CSM Guidance Development of Integrated Conceptual Site Models for Environmental OE Sites (USACE, 2003).

The CSM describes the site and its environmental setting. The CSM presents information regarding: 1) MEC and/or MC known or suspected to be at the site; 2) current and future reasonably anticipated or proposed uses of the real property; and 3) actual, potentially complete, or incomplete exposure pathways that link MEC and/or MC to receptors.

The CSM is presented in a series of information profiles that provide information about the site. The information profiles are included in Table 5-7-1 below.

Table 5.7-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #4		
Profile Type	Information Needs	Preliminary Assessment Findings
Site Profile	Installation Name	Detachment Fallbrook
	Installation Location	Detachment Fallbrook is located 53 miles north of San Diego in northern San Diego County, CA.
	Site Name	Dunnage Disposal Site #4 (IRP Site 34d)
	Site Location	The Dunnage Disposal Site #4 is in the central portion of the installation.
	Site History	The Dunnage Disposal Site #4 is a burial area for dunnage that was used from 1942 until 1978.
	Site Area and Layout	The Dunnage Disposal Site #4 covers approximately 1.8 acres.
	Site Structures	The remnant foundation of what may once have been Building 338 remains on the site.

Table 5.7-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #4

Profile Type	Information Needs	Preliminary Assessment Findings
	Site Boundaries	<p>Map 2.1-1 shows the location of the Dunnage Disposal Site #4.</p> <p>N: The northern boundary of the site is at the intersection of Fallbrook Creek and Maverick Road. North of the site extends an eucalyptus forest.</p> <p>S: South of the site is Ammunition Road.</p> <p>W: Coastal sage scrub extends west of the site.</p> <p>E: Fallbrook Creek and coastal sage scrub extend east of the site.</p>
	Site Security	<p>The Dunnage Disposal Site #4 is located on Detachment Fallbrook, which is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order, and for implementing access control policies and procedures. The Dunnage Disposal Site #4 is also located within a restricted area guarded by the security force.</p>
Munitions/ Release Profile	Munitions Types	<p>The Dunnage Disposal Site #4 is not a suspected MEC area</p>
	Maximum Probability Penetration Depth	<p>MEC are not expected at the site; therefore, penetration depths are not of concern</p>
	MEC Density	<p>The Dunnage Disposal Site #4 is not suspected to contain MEC</p>
	MEC Scrap/Fragments	<p>No evidence of MEC or munitions scrap was identified during the visual survey except for an empty ammunition canister. The canister appeared to have washed into the area due to runoff and did not appear to be related to disposal activities at the site.</p>
	Associated Munitions Constituents	<p>The Dunnage Disposal Site #4 is not suspected to contain MC.</p>
	Migration Routes/Release Mechanisms	<p>MEC and MC are not expected to be present at the site; therefore, migration and release mechanisms are not of concern.</p>

Table 5.7-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #4

Profile Type	Information Needs	Preliminary Assessment Findings
Physical Profile	Climate	The climate at Detachment Fallbrook is typical of the prevailing coastal southern California Mediterranean climate and is characterized by mild winters, cool summers, and infrequent rainfall. The annual average temperature is 63 °F. Precipitation ranges from 13.7 to 17.1 inches per year, with January being the wettest month and July the driest. Summers at the installation are punctuated by the Santa Ana (offshore) winds.
	Topography	The Dunnage Disposal Site #4 has low hills.
	Geology	The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information was not available.
	Soil	The soil at the Dunnage Disposal Site #4 is classified as a sandy loam of granitic origin and is moderately well drained.
	Hydrogeology	No site-specific groundwater depth data were available.
	Hydrology	The Dunnage Disposal Site #4 is in the Santa Margarita watershed. There are no surface water bodies in the Dunnage Disposal Site #4, which drains towards Fallbrook Creek.
	Vegetation	The vegetation in the area of the Dunnage Disposal Site #4 is considered to be mostly riparian with some coastal sage scrub and eucalyptus forest. Common species in coastal sage scrub habitat include coastal sagebrush, flat-topped buckwheat, laurel sumac, sage, goldenbush, and native grasses. Common species in riparian habitat include mulefat, arroyo willows, and elderberry.
Land Use and Exposure Profile	Current Land Use	The Dunnage Disposal Site #4 is closed and no longer in use.
	Current Human Receptors	MEC and MC are not expected to be present at the site; potential receptors are not of concern.
	Current Activities (frequency, nature of activity)	Activities at the site may include environmental and ecological surveys.
	Potential Future Land Use	The Dunnage Disposal Site #4 was closed in 1978. There is no change in land use planned.
	Potential Future Human Receptors	MEC and MC are not expected to be present at the site; potential receptors are not of concern.

Table 5.7-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #4		
Profile Type	Information Needs	Preliminary Assessment Findings
	Potential Future Land Use-Related Activities:	Any potential future land use activities would have to follow any Navy ESQD Arc waivers or exemptions. Other potential future activities at the site include environmental and ecological surveys.
	Zoning/Land Use Restrictions	Due to the proximity of the site to some of the installation's munitions storage bunkers, ESQD Arc restrictions apply to this site. The site is also listed as habitat for the Least Bell's vireo, which is a federally protected species.
	Demographics/Zoning	The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. Demographic data include the following: <ul style="list-style-type: none"> Town of Fallbrook: Population (U.S. Census, 2000): 29,100 San Diego County: Population (U.S. Census, 2000): 2,813,833
	Beneficial Resources	The coastal sage scrub and riparian habitats offer roosting and foraging resources for raptors.
Ecological Profile	Habitat Type	The Dunnage Disposal Site #4 contains riparian, coastal sage scrub, and eucalyptus habitat. The site is also in a zone designated as habitat for the federally endangered Least Bell's vireo.
	Degree of Disturbance	Current and anticipated future activities at the site, such as environmental and ecological surveys, may disturb habitat and/or ecological receptors known or potentially present within range areas.
	Ecological Receptors	
	General:	Common fauna included mammals (kangaroo rats, voles, deer, mice, ground squirrels, opossum, rabbits, and coyotes), amphibians (tree frogs), reptiles (orange-throated whiptails, rattlesnakes, and horned lizards), and birds (burrowing owls, kites, quails, sparrows, kingbirds, and hawks).
	Federal Threatened Species:	Coastal California gnatcatcher
	Federal Endangered Species:	Least Bell's vireo, Stephens' kangaroo rat, Arroyo toad, and Southwestern willow flycatcher

Table 5.7-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #4		
Profile Type	Information Needs	Preliminary Assessment Findings
	State Endangered Species:	Least Bell's vireo and Southwestern willow flycatcher
	State Threatened Species:	Stephens' kangaroo rat
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	MEC and MC are not expected to be present at the site; therefore, relationship between sources and receptors are not of concern.

MEC and MC exposure pathway analyses were not created for the Dunnage Disposal Site #4 because MEC and MC sources are not anticipated at the site. No evidence was found to suggest that the site was ever used as a munitions burial site. No visual evidence of MEC was observed during the visual survey.

5.7.12. Summary

The Dunnage Disposal Site #4 (IRP Site 34d) covers approximately 1.8 acres west of Building 388 in the central portion of Detachment Fallbrook. The Dunnage Disposal Site #4 was used from 1942 to 1978 as a disposal area for dunnage. The area is not currently in use. The remnant foundation of what may once have been Building 388 remains on the site. No evidence of MEC or MC was found at the Dunnage Disposal Site #4. The Dunnage Disposal Site #4 was initially considered a possible munitions burial site because of the evidence of MEC and munitions scrap that was found at two similar sites: Dunnage Disposal Site #1 and Dunnage Disposal Site #3. Investigation of the site and the installation records, and many follow-up interviews, indicate that the Dunnage Disposal Site #4 was not a munitions burial site.

5.7.13. Recommendations

Based on the data collected and presented in this PA, NFA for MEC and MC is recommended at the Dunnage Disposal Site #4. Any further investigations at the site will be undertaken under the IRP.

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Map 5.7-1
Visual Survey
Dunnage Disposal Site #4 (IRP Site 34d)

Legend

Dunnage Disposal Site #4*

Site Reconnaissance Path

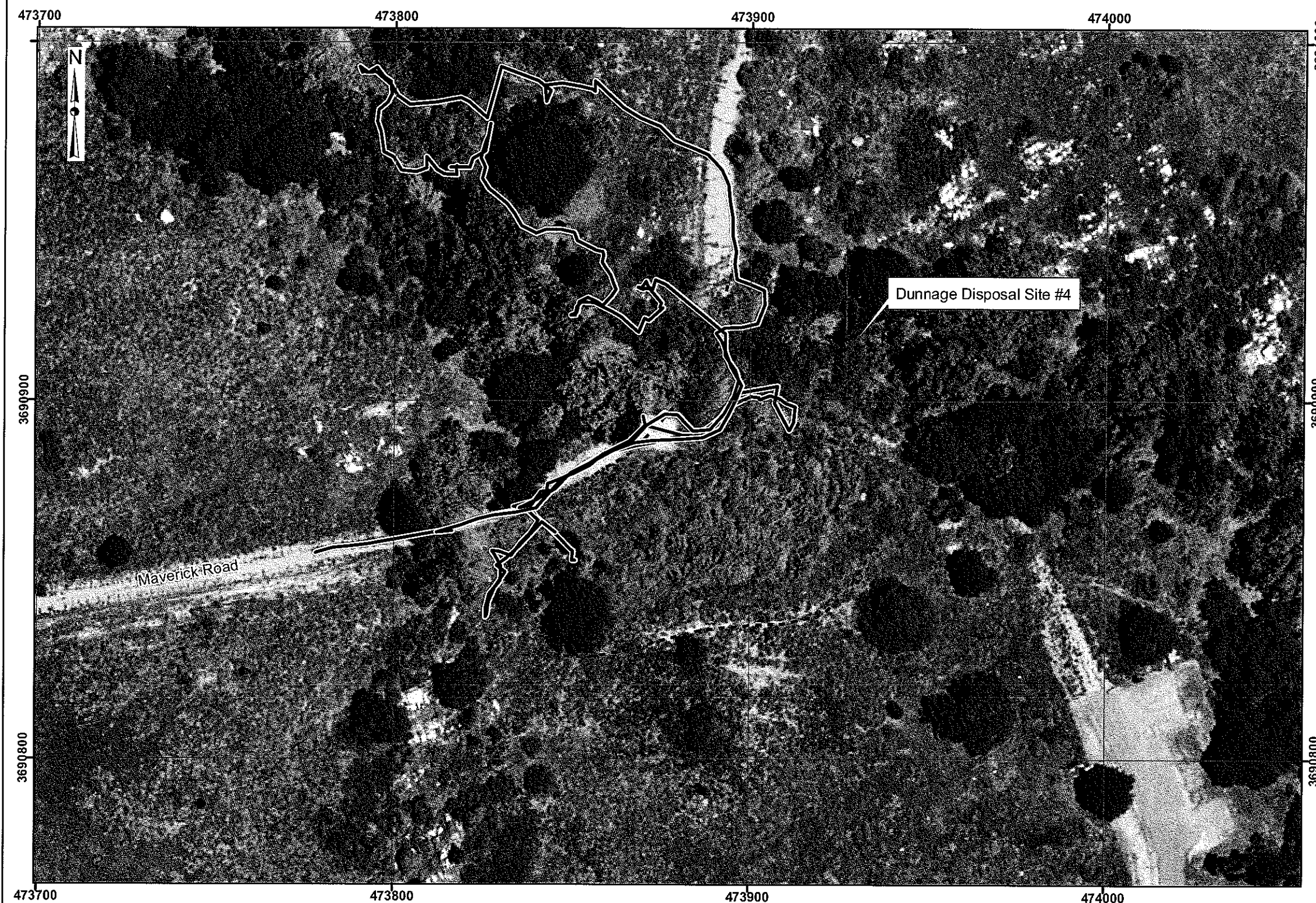
* Approximate boundary of the site.

0 30 60 Meters

Data Source: Anteon Corporation,
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006



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NAWPNSTA Seal Beach
Detachment Fallbrook, California



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Map 5.7-2
Site Details
Dunnage Disposal Site #4 (IRP Site 34d)

Legend

- Dunnage Disposal Site #4 (IRP Site 34d)*
- Streams
- Topographic Contours (ft above MSL)

* Approximate boundary of the Site.

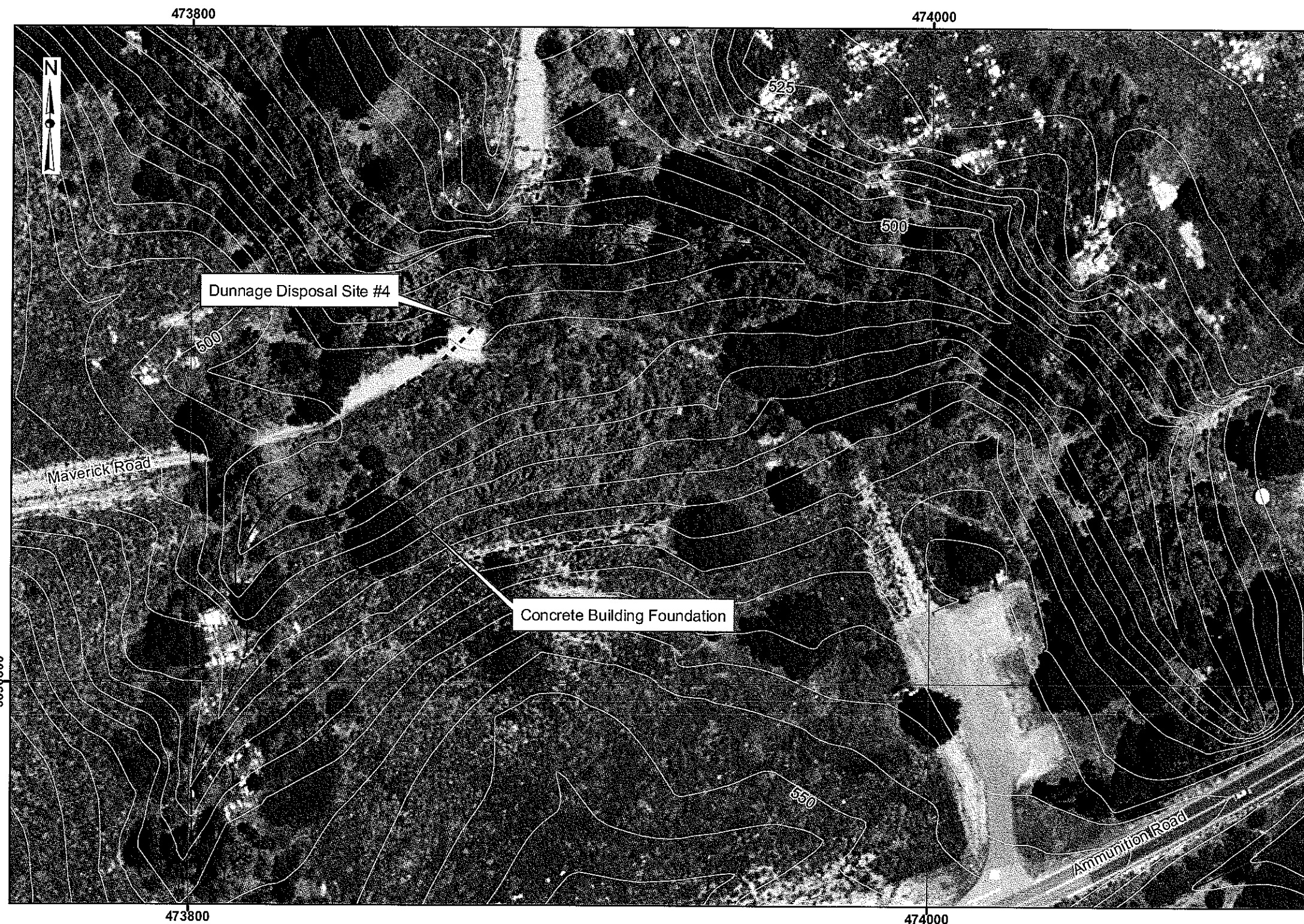
0 30 Meters

Data Source: Anteon Corporation,
Orthophoto, June 3, 2004
NAWPNSTA Seal Beach GIS Data,
Vector Contour Data

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

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NAWPNSTA Seal Beach
Detachment Fallbrook, California
Dunnage Disposal Site #4



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Map 5.7-3
Munitions Characterization
Dunnage Disposal Site #4 (IRP Site 34d)

Legend

 Dunnage Disposal Site #4*

MEC Presence**

 Known

 Suspect

* Approximate boundary of the site.

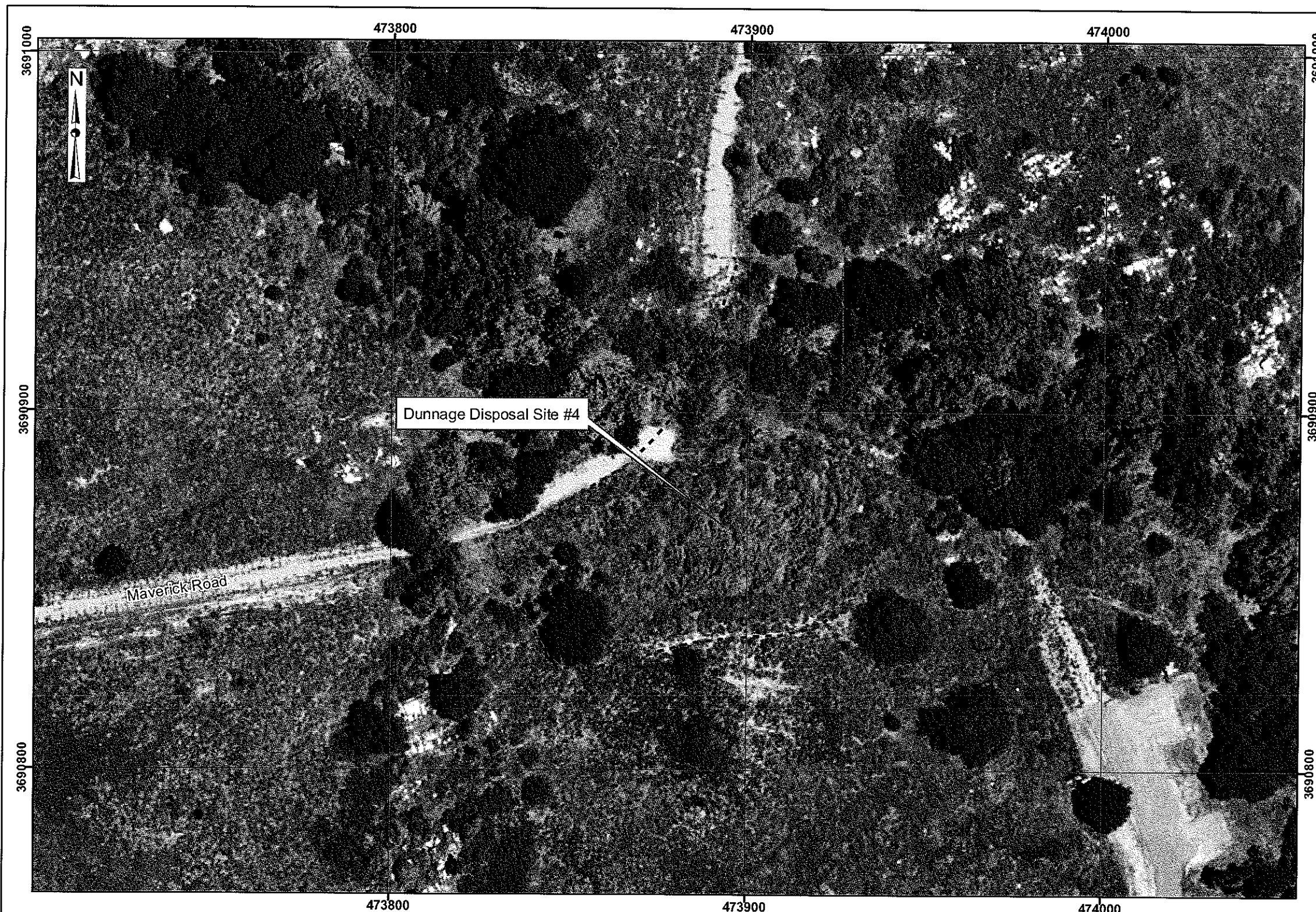
** There is no evidence of MEC
presence as determined through historical
documentation, interview, and visual survey.

0 30 60 Meters

Data Source: Anteon Corporation,
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

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5.8. Dunnage Disposal Site #5

The Dunnage Disposal Site #5 is in the southwest corner of Detachment Fallbrook. The site straddles Harm Road west of Ammunition Road and covers approximately 0.7 acres.

5.8.1. History and Site Description

The Dunnage Disposal Site #5 (IRP Site 34e) was used from 1942 to 1978 as a disposal area for dunnage. The area is not currently in use. The Dunnage Disposal Site #5 was initially considered a possible munitions burial site because of the evidence of MEC and munitions scrap that was found at two similar sites: Dunnage Disposal Site #1 and Dunnage Disposal Site #3. Investigation of the site and the installation records, and many follow-up interviews, indicate that the Dunnage Disposal Site #5 was not used for munitions burial. Figure 5.8-1 shows a view of the Dunnage Disposal Site #5. No IRP investigations have been undertaken.



Figure 5.8-1: View of the Dunnage Disposal Site #5 looking south. Photograph was taken during the March 2005 on-site visual survey.

5.8.1.1. Topography

The Dunnage Disposal Site #5 is an artificial raised foundation for Harm Road, which is paved. For further information on the topography of Detachment Fallbrook, see Section 3.2.

5.8.1.2. Geology

The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information for the Dunnage Disposal Site #5 was not available. Section 3.3 includes a general description of the geology of Detachment Fallbrook.

5.8.1.3. Soil and Vegetation Types

The soil at the Dunnage Disposal Area #5 is classified as a sandy loam of granitic origin and is moderately well-drained. Section 3.4 includes a general description of the soil types at Detachment Fallbrook.

The vegetation in the area of the Dunnage Disposal Site #5 is considered to be mostly mixed grasslands with some coastal sage scrub. Common species in mixed grassland habitat include native, perennial bunch grasses such as *Nassella* spp. mixed with nonnative annuals. Common species in coastal sage scrub habitat include coastal sagebrush (*Artemisia californica*), flat-topped buckwheat (*Eriogonum fasciculatum*), laurel sumac (*Malosma laurina*), sage (*Salvia* spp.), goldenbush (*Isocoma menziesii*), and native grasses (*Nassella* spp.) Section 3.5 includes a general description of the vegetation types at Detachment Fallbrook.

5.8.1.4. Hydrology

The Dunnage Disposal Site #5 is within the San Luis Rey watershed. There are no surface water bodies on Dunnage Disposal Site #5. The site drains into Pilgrim Creek, which flows through MCB Camp Pendleton and the City of Oceanside before joining the San Luis River. Section 3.6 includes a general description of the hydrology at Detachment Fallbrook.

5.8.1.5. Hydrogeology

No site-specific groundwater depth data were available. Section 3.7 includes a general description of the hydrogeology at Detachment Fallbrook.

5.8.1.6. Cultural and Natural Resources

The data collection team for the Dunnage Disposal Site #5 found no documentation of significant cultural resources at or near the former site. Detachment Fallbrook has large areas of undisturbed land that can serve as suitable habitat to threatened and endangered species. Section 3.8 includes a general description of the cultural and natural resources at Detachment Fallbrook.

5.8.1.7. Endangered and Special Status Species

Threatened and endangered species data for Detachment Fallbrook are presented in Section 3.9. According to the California Wildlife and Habitat Analysis Branch, threatened and endangered species associated with the critical habitats of the former range that are known or have been documented within or adjacent to the Detachment Fallbrook are the Stephens' kangaroo rat, coastal California gnatcatcher, and Least Bell's vireo.

5.8.2. Visual Survey Observations and Results

The data collection team conducted a visual survey of the Dunnage Disposal Site #5 on March 8, 2005. During the visual survey, the following Malcolm Pirnie team members were present: Mr. Chip Poalinelli, Mr. Dan Hains, and Mr. Scott Lehman. The field team conducted the visual survey by walking the perimeter of the site. No evidence of MEC or munitions scrap was identified during the visual survey. Construction debris and other non-munitions related trash were observed at the site.

5.8.3. Munitions and Munitions Related Materials Associated with the Site

The Dunnage Disposal Site #5 is not suspected to contain MEC. The Dunnage Disposal Site #5 was initially considered a possible munitions burial site because of the evidence of MEC and munitions scrap that was found at two similar sites: Dunnage Disposal Site #1 and Dunnage Disposal Site #3. Investigation of the site and the installation records, and many follow-up interviews, indicate that the Dunnage Disposal Site #5 was not a munitions burial site.

5.8.4. MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence including: Known MEC Areas, Suspected MEC Areas, and Areas Not Suspected to Contain MEC to indicate that MEC is known or is suspected to be at the site. Map 5.8-3 illustrates the munitions characterization of the Dunnage Disposal Site #5, and is provided at the end of Section 5.8. The MEC presence is discussed below.

5.8.4.1. Known MEC Areas

There are no Known MEC Areas at the Dunnage Disposal Site #5.

5.8.4.2. Suspected MEC Areas

There are no Suspected MEC Areas at the Dunnage Disposal Site #5

5.8.4.3. Areas Not Suspected to Contain MEC

The Dunnage Disposal Site #5 is Not Suspected to Contain MEC.

5.8.5. Ordnance Penetration Estimates

MEC are not expected at the Dunnage Disposal Site #5; therefore, penetration depths are not of concern.

5.8.6. Munitions Constituents

The Dunnage Disposal Site #5 is not suspected to contain MC.

5.8.7. Contaminant Migration Routes

MEC and MC are not expected to be present at the site; migration and release mechanisms are not of concern.

5.8.8. Receptors and Pathways

MEC and MC are not expected to be present at the site; potential receptors and pathways are not of concern.

5.8.8.1. Nearby Populations

Fallbrook and San Diego County have populations of 29,100, and 2,813,833, respectively (U.S. Census Bureau, 2000). The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. The Dunnage Disposal Site #5 is approximately 17,710 feet from the housing complex at the installation. See Section 2.1 for more information on the housing complex.

5.8.8.2. Buildings Near/Within Site

There are no buildings on the site or within 1 mile of the Dunnage Disposal Site #5.

5.8.8.3. Utilities On/Near Site

There were no utilities on the Dunnage Disposal Site #5. A Fallbrook Sanitation District line is located approximately 0.1 miles to the east of the site. To the north and east of the site are U.S. government phone lines, approximately 0.05 miles and 0.1 miles away, respectively.

5.8.9. Land Use

The Dunnage Disposal Site #5 is closed and is no longer used.

5.8.10. Access Controls / Restrictions

The Dunnage Disposal Site #5 is located on Detachment Fallbrook, which is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order, and for implementing access control policies and procedures. The Dunnage Disposal Site #5 is also located within a restricted area guarded by the security force.

5.8.11. Conceptual Site Model

This CSM was developed following guidance documents issued by the USEPA for hazardous waste sites and the USACE for OE sites. Guidance documents included the USEPA's Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA/540/G-89/004) and the Final USACE CSM Guidance Development of Integrated Conceptual Site Models for Environmental OE Sites (USACE, 2003).

The CSM describes the site and its environmental setting. The CSM presents information regarding: 1) MEC and/or MC known or suspected to be at the site; 2) current and future reasonably anticipated or proposed uses of the real property; and 3) actual, potentially complete, or incomplete exposure pathways that link them.

The CSM is presented in a series of information profiles that provide information about the site. The information profiles are included in Table 5.8-1 below.

Table 5.8-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #5		
Profile Type	Information Needs	Preliminary Assessment Findings
Site Profile	Installation Name	Detachment Fallbrook
	Installation Location	Detachment Fallbrook is located 53 miles north of San Diego in northern San Diego County, CA.
	Site Name	Dunnage Disposal Site #5 (IRP Site 34e)
	Site Location	The Dunnage Disposal Site #5 is in the southwest corner of the installation.
	Site History	The Dunnage Disposal Site #5 is a burial area for dunnage, which was used from 1942 until 1978. The Dunnage Disposal Site #5 was initially considered a possible munitions burial site because of the evidence of MEC and munitions scrap that was found at two similar sites: Dunnage Disposal Site #1 and Dunnage Disposal Site #3. Investigation of the site and the installation records, and many follow-up interviews, indicate that Dunnage Disposal Site #5 was not a munitions burial site.
	Site Area and Layout	The Dunnage Disposal Site #5 is approximately 0.7 acres.
	Site Structures	Part of the Dunnage Disposal Site #5 is currently under a paved road.
	Site Boundaries	Map 2.1-1 shows the location of the Dunnage Disposal Site #5. N: Harm Road runs north of the site with storage magazines located off of the road. S: Ammunition Road runs south of the site to the gate with MCB Camp Pendleton. W: West of the site is mixed grassland and coastal sage scrub habitat bordered by Harm Road. E: Ammunition Road borders the site to the east.
	Site Security	The Dunnage Disposal Site #5 is located on Detachment Fallbrook, which is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order, and for implementing access control policies and procedures. The Dunnage Disposal Site #5 is also located within a restricted area guarded by the security force.
	Munitions/Release	Munitions Types The Dunnage Disposal Site #5 is not a suspected MEC area.

Table 5.8-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #5

Profile Type	Information Needs	Preliminary Assessment Findings
Profile	Maximum Probability Penetration Depth	MEC are not expected to be present at the site; therefore, penetration depths are not a concern
	MEC Density	The Dunnage Disposal Site #5 is not suspected to contain MEC.
	MEC Scrap/Fragments	No evidence of MEC or munitions scrap was identified during the visual survey.
	Associated Munitions Constituents	The Dunnage Disposal Site #5 is not suspected to contain MC.
	Migration Routes/Release Mechanisms	MEC and MC are not expected to be present at the site; therefore, migration and release mechanisms are not of concern
Physical Profile	Climate	The climate at Detachment Fallbrook is typical of the prevailing coastal southern California Mediterranean climate and is characterized by mild winters, cool summers, and infrequent rainfall. The annual average temperature is 63 °F. Precipitation ranges from 13.7 to 17.1 inches per year, with January being the wettest month and July the driest. Summers at the installation are punctuated by the Santa Ana (offshore) winds.
	Topography	The Dunnage Disposal Site #5 is an artificial foundation for a paved road.
	Geology	The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information was not available.
	Soil	The soil at the Dunnage Disposal Site #5 is classified as a sandy loam of granitic origin and is moderately well drained
	Hydrogeology	No site-specific groundwater depth data were available.
	Hydrology	The Dunnage Disposal Site #5 is within the San Luis Rey watershed. There are no surface water bodies in the Dunnage Disposal Site #5. The Dunnage Disposal Site #5 drains primarily into Pilgrim Creek, which flows through MCB Camp Pendleton and the City of Oceanside before joining the San Luis River

Table 5.8-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #5		
Profile Type	Information Needs	Preliminary Assessment Findings
Land Use and Exposure Profile	Vegetation	The vegetation in the area of the Dunnage Disposal Site #5 is considered to be mostly mixed grassland with some coastal sage scrub. Common species in mixed grassland habitat include native, perennial bunch grasses mixed with nonnative annuals. Common species in coastal sage scrub habitat include coastal sagebrush, flat-topped buckwheat, laurel sumac, sage, goldenbush, and native grasses.
	Current Land Use	The Dunnage Disposal Site #5 is closed and is no longer in use.
	Current Human Receptors	MEC and MC are not expected to be present at the site; potential receptors are not of concern.
	Current Activities (frequency, nature of activity)	Activities at the site may include environmental and ecological surveys.
	Potential Future Land Use	The Dunnage Disposal Site #5 was closed in 1978. There is no change in land use planned.
	Potential Future Human Receptors	MEC and MC are not expected to be present at the site; potential receptors are not of concern.
	Potential Future Land Use-Related Activities:	Any potential future land use activities would have to follow any Navy ESQD Arc waivers or exemptions. Other potential future activities at the site include environmental and ecological surveys.
	Zoning/Land Use Restrictions	Due to the proximity of the site to some of the installation's munitions storage bunkers, ESQD Arc restrictions apply to this site. The site is also listed as habitat for the Stephens' kangaroo rat, which is a federally protected species.
	Demographics/Zoning	The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. Demographic data include the following: <ul style="list-style-type: none"> Town of Fallbrook: Population (U.S. Census, 2000): 29,100 San Diego County: Population (U.S. Census, 2000): 2,813,833
	Beneficial Resources	The coastal sage scrub and mixed grasslands habitats offer roosting and foraging resources for raptors.

Table 5.8-1: Conceptual Site Model Information Profiles – Dunnage Disposal Site #5		
Profile Type	Information Needs	Preliminary Assessment Findings
Ecological Profile	Habitat Type	The Dunnage Disposal Site #5 contains mixed grasslands and some coastal sage scrub habitat. The site is also in a zone designated as habitat for the federally endangered Stephens' kangaroo rat.
	Degree of Disturbance	Current and anticipated future activities at the site, such as environmental and ecological surveys, may disturb habitat and or ecological receptors known or potentially present within range areas.
	Ecological Receptors	
	General:	Common fauna included mammals (kangaroo rats, voles, deer, mice, ground squirrels, opossum, rabbits, and coyotes), amphibians (tree frogs), reptiles (orange-throated whiptails, rattlesnakes, and horned lizards), and birds (burrowing owls, kites, quails, sparrows, kingbirds, and hawks).
	Federal Endangered Species:	Stephens' kangaroo rat and Least Bell's vireo
	Federal Threatened Species:	Coastal California gnatcatcher
	State Endangered Species:	Least Bell's vireo
	State Threatened Species	Stephens' kangaroo rat
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	MEC and MC are not expected to be present at the site; therefore, relationship between sources and receptors are not of concern

MEC and MC exposure pathway analyses were not performed for the Dunnage Disposal Site #5 because MEC and MC sources are not suspected at the site. No evidence was found to suggest that the site was ever used as a munitions burial site. No visual evidence of MEC was observed during the visual survey.

5.8.12. Summary

The 0.7-acre Dunnage Disposal Site #5 is in the southwest corner of Detachment Fallbrook. The Dunnage Disposal Site #5 (IRP Site 34e) was used from 1942 to 1978 as a disposal area for dunnage. The area is not currently in use. No evidence of MEC or MC was found at the Dunnage Disposal Site #5. The Dunnage Disposal Site #5 was initially considered a possible munitions burial site because of the evidence of MEC and munitions scrap that was found at two similar sites: Dunnage Disposal Site #1 and Dunnage Disposal Site #3. Investigation of the site

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and the installation records, and many follow-up interviews, indicate that the Dunnage Disposal Site #5 was not a munitions burial site.

5.8.13. Recommendations

Based on the data collected and presented in this PA, NFA for MEC and MC is recommended at the Dunnage Disposal Site #5. Any further investigations at the site will be undertaken under the IRP.



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NAWPNSTA Seal Beach
Detachment Fallbrook, California



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Map 5.8-1
Visual Survey
Dunnage Disposal Site #5 (IRP Site 34e)

Legend

-  Dunnage Disposal Site #5*
-  Site Reconnaissance Path

* Approximate boundary of the site

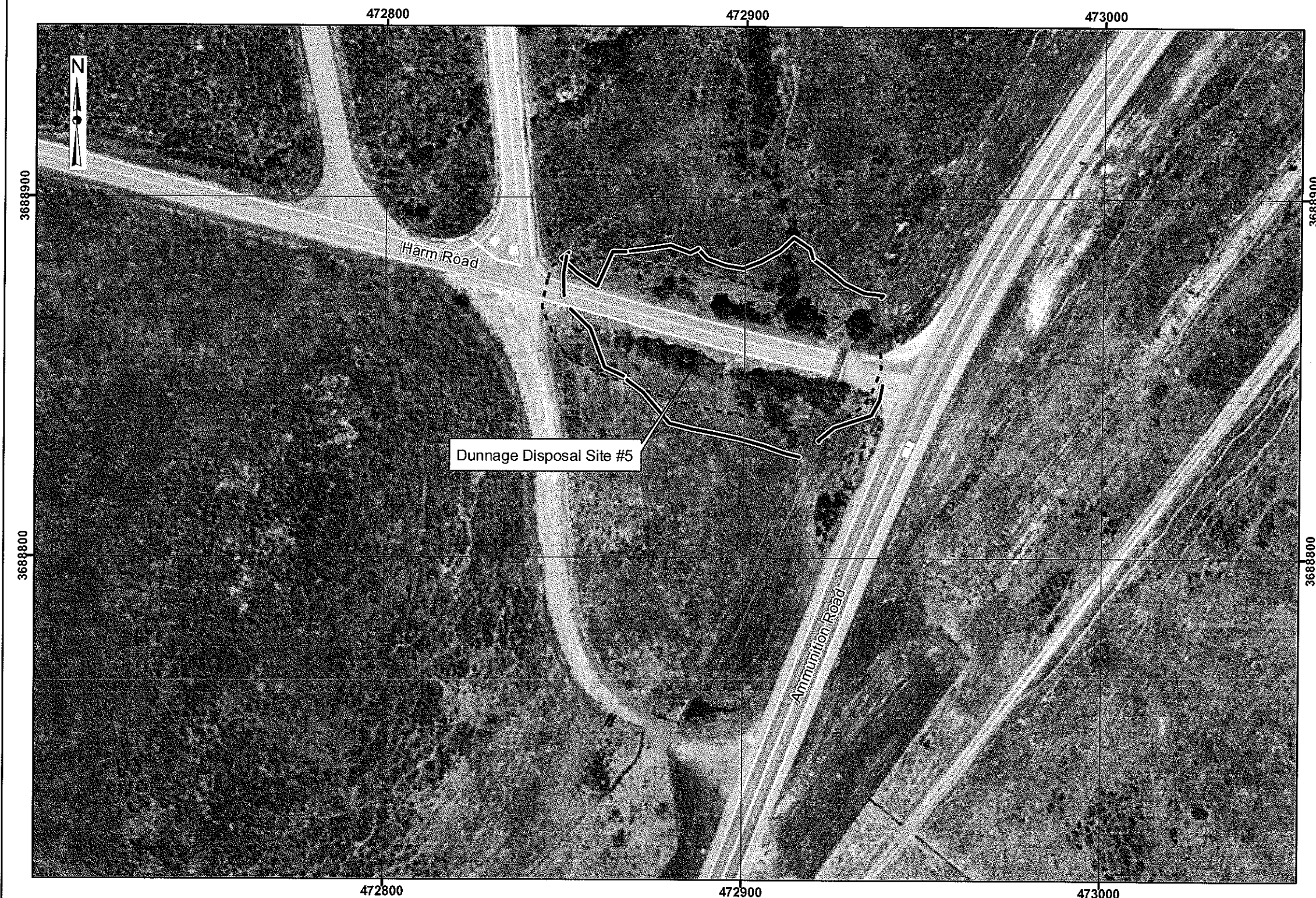
0 30 60 Meters



Data Source: Anteon Corporation,
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

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Date: June 2006






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NAWPNSTA Seal Beach
Detachment Fallbrook, California



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Map 5.8-2
Site Details
Dunnage Disposal Site #5 (IRP Site 34e)

Legend

-  Dunnage Disposal Site #5*
-  Streams
-  Topographic Contours (ft above MSL)

* Approximate boundary of the Site.

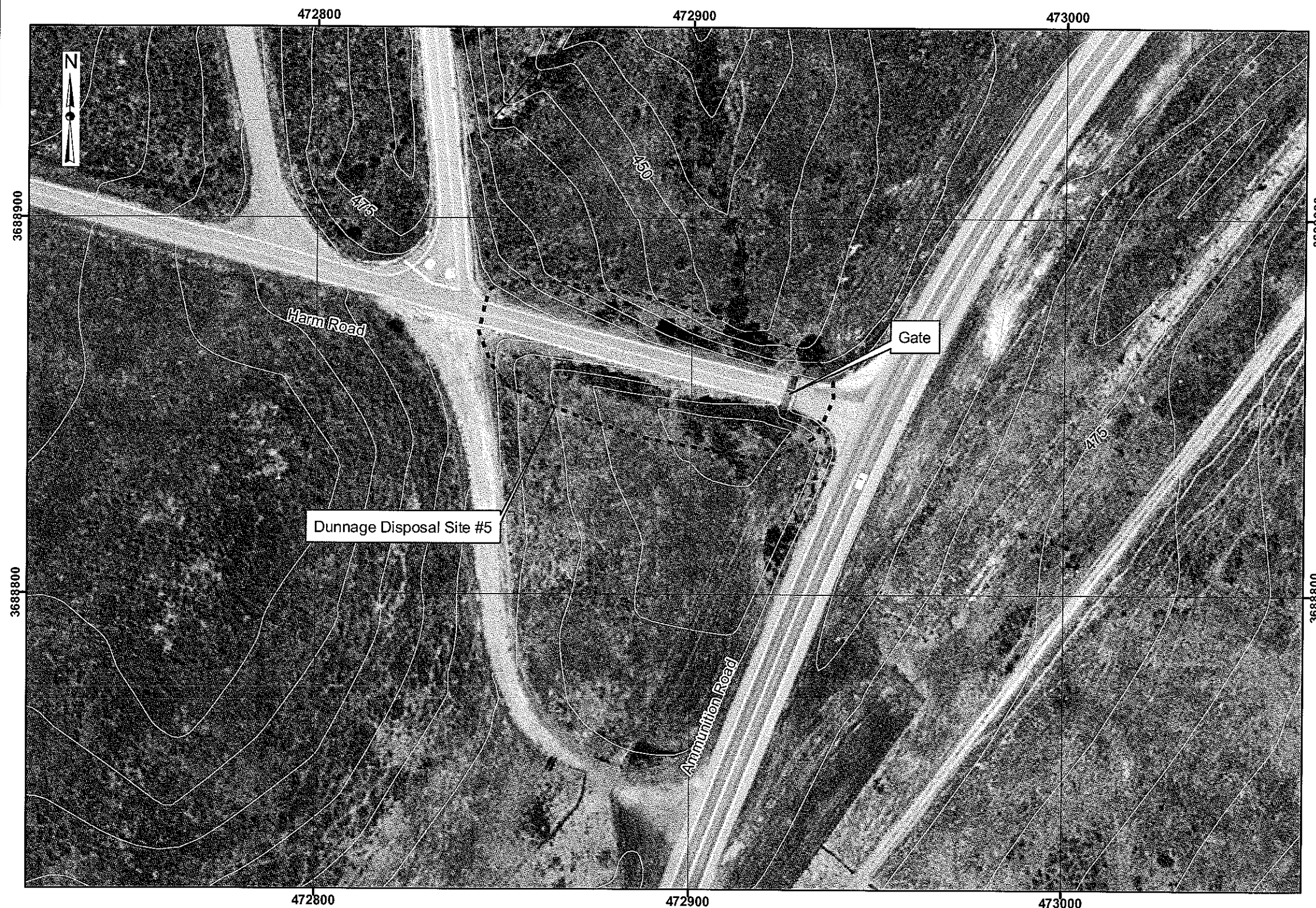
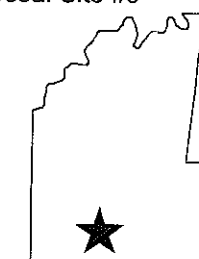
0 30 60 Meters

Data Source: Anteon Corporation,
Orthophoto, June 3, 2004
NAWPNSTA Seal Beach GIS Data,
Vector Contour Data

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

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NAWPNSTA Seal Beach
Detachment Fallbrook, California
Dunnage Disposal Site #5



Preliminary Assessment
NAWPNSTA Seal Beach
Detachment Fallbrook, California



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Map 5.8-3
Munitions Characterization
Dunnage Disposal Site #5 (IRP Site 34e)

Legend

Dunnage Disposal Site #5*

MEC Presence**

Known

Suspect

* Approximate boundary of the site.

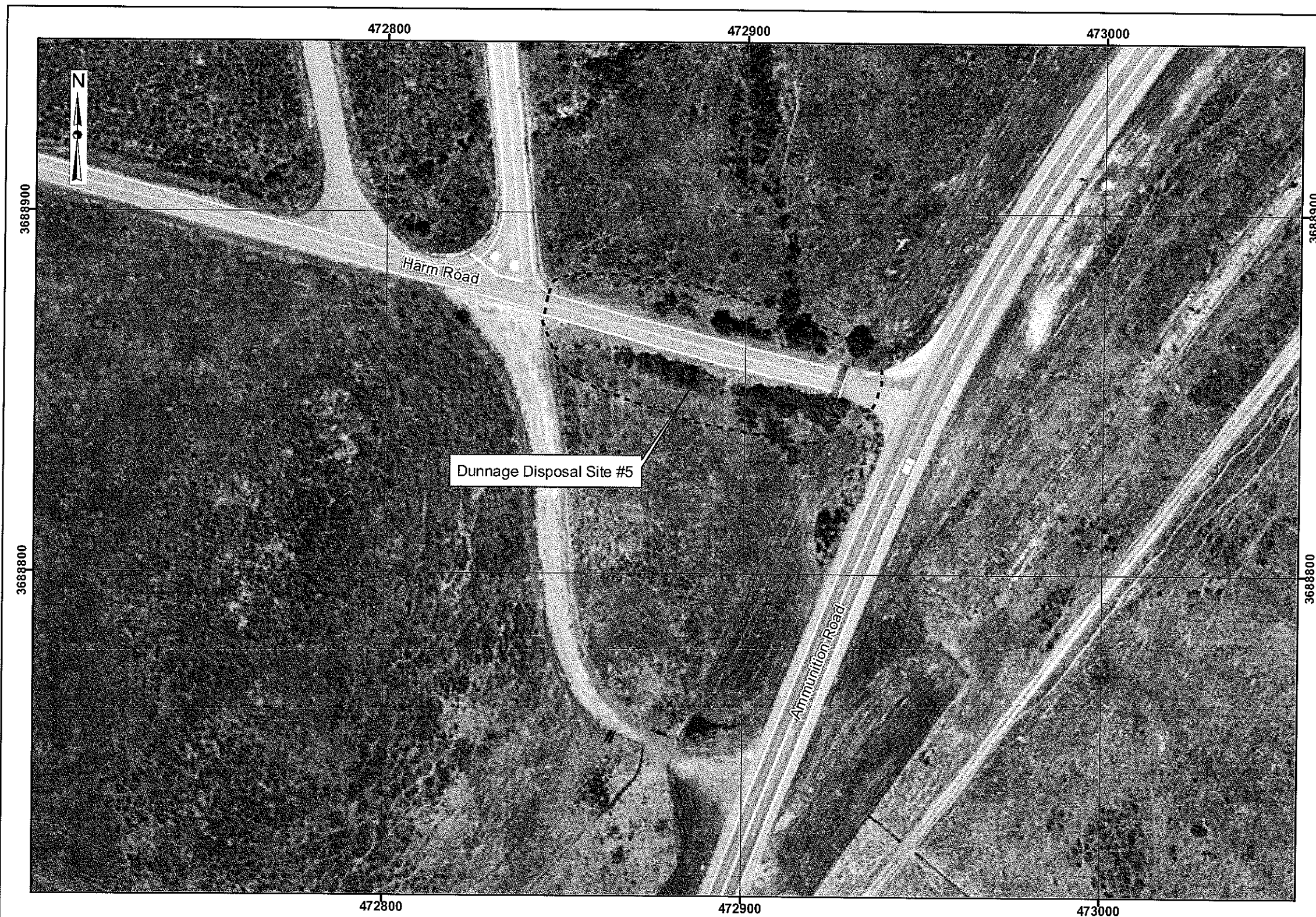
** There is no evidence of MEC
presence as determined through historical
documentation, interview, and visual survey

0 30 60 Meters

Data Source: Anteon Corporation,
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

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5.9. Fallbrook Skeet/Trap Range

The Skeet/Trap Range is in the central plateau of Detachment Fallbrook, near the eastern border. The site is bordered to the east by the SF Small Arms Range. The Skeet/Trap Range covers approximately 31 acres.

5.9.1. History and Site Description

The Skeet/Trap Range is adjacent to the northwestern border of the SF Small Arms Range and was a recreational skeet/trap range that was used by the Marine Security Forces and other station personnel after work hours from 1950 to 1987. Munitions use at the range was limited to 12-gauge shotgun ammunition according to Mr. Kenneth A. Kaptein and other interviewees. The firing lines and the skeet shooting equipment were located on a shelf at the top of a hill. The range was oriented for firing to the west. The area is not currently in use. Figure 5.9-1 shows the firing point for the range.



Figure 5.9-1: View of firing point for range. Photograph was taken during the September 2004 visual survey.

Based on review of aerial and still photographs, information obtained from interviews, and observations made during the visual survey, the Skeet/Trap Range was constructed and used as a single field shotgun range. According to Army Technical Manuals (referenced as AR 750-10 and

TM 9-855) and the Navy Programming Guide (1958), the shooting field (i.e., firing arc) was laid out as a 63 foot radius semi-circle. The surface danger zone (which includes the down range hazard area and safety fan) consisted of a semi-circle with a 900-foot radius that utilized the same apex as the shooting field. For a single field range, the acreage of the surface danger zone (SDZ) was approximately 30 acres. An example of a typical SDZ for a single field skeet range is provided in Figure 5.9-2.

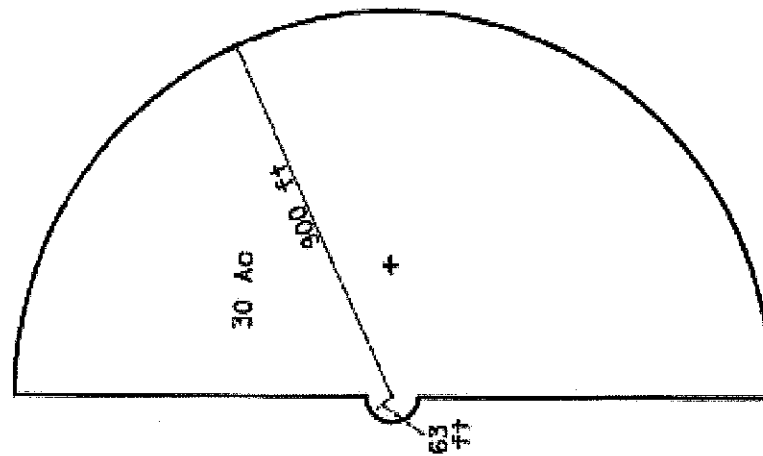


Figure 5.9-2: SDZ for a typical single field skeet range

The site boundary, which is also the SDZ, for the Skeet/Trap Range encompasses the firing arc, target area, and impact area where the lead shot and broken clay targets would be found plus the area where the weapons, when fired from the firing arc, could endanger personnel. The SDZ was used to define the area between the firing arc and target area, the impact area, the ricochet trajectory area, and the secondary danger area. The boundary/SDZ for the Skeet/Trap Range is shown in Map 5.9-2.

5.9.1.1. Topography

The Skeet/Trap Range is mainly flat, except for the hills on the northeastern boundary of the range. For further information on the topography of Detachment Fallbrook, see Section 3.2.

5.9.1.2. Geology

The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information for the Skeet/Trap Range was not available. Section 3.3 includes a general description of the geology of Detachment Fallbrook

5.9.1.3. Soil and Vegetation Types

Soil at the Skeet/Trap Range is classified as a sandy loam of granitic origin and is moderately well-drained. Section 3.4 includes a general description of the soil types at Detachment Fallbrook

The vegetation in the area of the Skeet/Trap Range is composed of coastal sage scrub and mixed grassland, with a eucalyptus grove nearby. Common species in coastal sage scrub habitat include coastal sagebrush (*Artemisia californica*), flat-topped buckwheat (*Eriogonum fasciculatum*), laurel sumac (*Malosma laurina*), sage (*Salvia* spp.), goldenbush (*Isocoma menziesii*), and native grasses (*Nassella* spp.). Common species in mixed grassland habitat are mostly native, perennial bunch grasses, such as *Nassella* spp., mixed with nonnative annuals. Section 3.5 includes a general description of the vegetation types at Detachment Fallbrook.

5.9.1.4. Hydrology

The Skeet/Trap Range is in the Santa Margarita watershed. There are no surface water bodies on the Skeet/Trap Range. The site primarily drains into Fallbrook Creek. Section 3.6 includes a general description of the hydrology at Detachment Fallbrook.

5.9.1.5. Hydrogeology

No site-specific groundwater depth data were available. Section 3.7 includes a general description of the hydrogeology at Detachment Fallbrook.

5.9.1.6. Cultural and Natural Resources

The data collection team for the Skeet/Trap Range found no documentation of significant cultural resources at or near the former range. Detachment Fallbrook has large areas of undisturbed land that can serve as suitable habitat to threatened and endangered species. Section 3.8 includes a general description of the cultural and natural resources at Detachment Fallbrook.

5.9.1.7. Endangered and Special Status Species

Threatened and endangered species data for Detachment Fallbrook are presented in Section 3.9. The on-site coastal sage scrub vegetation, grasslands, and the nearby eucalyptus grove offer roosting, foraging, and nesting resources for raptors. According to the California Wildlife and Habitat Analysis Branch, threatened and endangered species associated with the critical habitats of the former range that are known or have been documented within or adjacent to the Detachment Fallbrook are the coastal California gnatcatcher, Least Bell's vireo, and Stephens' kangaroo rat.

5.9.2. Visual Survey Observations and Results

The data collection team conducted a visual survey of the Skeet/Trap Range on September 29, 2004. Present during the first visual survey were Mr. Chip Poalinelli, Mr. Al Larkins, and Mr. Scott Lehman. The following Navy representatives were present during the visual survey: Ms. Pei-Fen Tamashiro, Mr. Robbie Knight, and Mr. Si Le. The field team conducted the visual survey by walking the perimeter of the entire range, then walking several transects across the Skeet/Trap Range. During the visual survey, the data collection team did not observe lead shot or broken clay targets. According to interviewees, the range was used infrequently, which could explain the lack of munitions scrap in the area. Another explanation could be that the soil was disked to keep the vegetative fuel load low. This could have disturbed and buried any evidence of munitions scrap.

Figure 5.9-2 shows a photograph of the site. A visual depiction of the site reconnaissance is provided on Map 5.9-1 located at the end of Section 5.9. Additional range/site details are illustrated on Map 5.9-2 also located at the end of Section 5.9.



Figure 5.9-3: View of the Skeet/Trap Range. Photograph was taken during the September 2004 on-site visual survey.

5.9.3. Munitions and Munitions Related Materials Associated with the Site

This section describes the munitions or munitions related materials, including the types and estimated maximum penetration depths, known or suspected to be at the former range. This includes both MEC and non-hazardous munitions related scrap (e.g., fragments, base plates, and inert mortar fins).

The data collection team was not able to locate historical records stating the potential types of munitions that were used at the Skeet/Trap Range. According to personnel interviewed, munitions used at the range would have been limited to 12-gauge shotgun ammunition. The available technical data sheet on the item is included in Appendix D.

Based on the information obtained during the data collection process, the Skeet/Trap Range is not suspected to contain CWM filled munitions, electrically fused munitions, or DU associated munitions.

5.9.4. MEC Presence

The entire former range has been subdivided and categorized into one of three levels of MEC presence including: Known MEC Areas, Suspected MEC Areas, and Areas Not Suspected to Contain MEC to indicate that MEC is known or is suspected to be at the former range. Map 5-9-3 illustrates the munitions characterization of the Skeet/Trap Range, and is provided at the end of Section 5-9. The MEC presence is discussed below.

5.9.4.1. Known MEC Areas

There are no Known MEC Areas associated with the Skeet/Trap Range because the site was used only for shotgun training. There is no historical or known evidence of explosives used at the site, so there is no evidence of MEC.

5.9.4.2. Suspected MEC Areas

There are no Suspected MEC Areas associated with the Skeet/Trap Range because the site was used only for shotgun training. There is no historical or known evidence of explosives used at the site, so there is no evidence of MEC.

5.9.4.3. Areas Not Suspected to Contain MEC

Based on observations made and data collected during the PA process, the 31-acre site, as well as the SDZ associated with the Skeet/Trap Range, is not suspected to contain MEC.

5.9.5. Ordnance Penetration Estimates

The depth to which munitions penetrate below the ground surface depends on many factors, including the type of soil, the angle of impact, the size of the munitions, the velocity at impact, and site-specific environmental conditions. Over the years, the DoD has studied and modeled munitions penetration depths and has issued various guidance and technical documents on the subject. The technical documents, however, apply to air dropped and indirect fire weapons and do not apply to skeet ranges. By design, skeet ammunition is dispersed as pellets over a small area in the direction of fire. According to the Navy Programming Guide (1958), the minimum surface danger zone for a skeet range is 900 feet. Pellets dispersed from a shotgun would be deposited on the ground surface well within this zone and would not penetrate the ground surface unless disturbed.

5.9.6. Munitions Constituents

MC associated with the use of the property as a skeet/trap range could be present at the Skeet/Trap Range. The primary MC is the lead from shotgun ammunition. Other MCs include antimony, arsenic, copper, nickel, zinc, and other constituents associated with black or smokeless powder. Polycyclic aromatic hydrocarbons (PAHs) may also be a MC if clay targets were used at the range. PAHs in clay targets tend to be tightly bound to the matrix of the target and are not readily available to the environment. Based on discussions with installation personnel, surface soil sampling has not occurred.

5.9.7. Contaminant Migration Routes

Migration of MC may occur through surface soil erosion due to runoff and wind. Future construction, excavation, and maintenance at the site are also potential release mechanisms. MC in runoff could potentially end up in surface water or sediment. MC could also potentially leach through soils or surface waters to groundwater.

5.9.8. Receptors and Pathways

Potential human receptors at the Skeet/Trap Range include Navy personnel, visitors, and contractors. Ecological receptors may come into direct contact with MC in soil while foraging or burrowing. Ecological receptors may also come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and prey).

5.9.8.1. Nearby Populations

Fallbrook and San Diego County have populations of 29,100, and 2,813,833, respectively (U.S. Census Bureau, 2000). The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. The Skeet/Trap Range is approximately 7,870 feet from the housing complex at the installation. See Section 2.1 for more information on the housing complex.

5.9.8.2. Buildings Near/Within Site

There are currently no buildings on the Skeet/Trap Range. Building 366 is located approximately 2,790 feet southwest of the site. The building is currently not in use and is on a list to be demolished. The eastern boundary of Detachment Fallbrook is approximately 1,395 feet away. Beyond the Detachment's boundary lies the Town of Fallbrook.

5.9.8.3. Utilities On/Near Site

While there are no utilities on the Skeet/Trap Range, there are some utility lines near the site. U.S. government phone lines are located within 0.2 miles of the western extent of the site. Approximately 0.2 miles from the site, is a Fallbrook Sanitation District line.

5.9.9. Land Use

The Skeet/Trap Range is closed and is no longer in use as a range.

5.9.10. Access Controls / Restrictions

The Skeet/Trap Range is located on Detachment Fallbrook, which is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order and for implementing access control policies and procedures. Access to the Skeet/Trap Range from within Detachment Fallbrook is controlled by a locked fence.

5.9.11. Conceptual Site Model

This CSM was developed following guidance documents issued by the USEPA for hazardous waste sites and the USACE for OE sites. Guidance documents included the USEPA's Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA/540/G-89/004) and the Final USACE CSM Guidance Development of Integrated Conceptual Site Models for Environmental OE Sites (USACE, 2003).

The CSM describes the site and its environmental setting. The CSM presents information regarding: 1) MEC and/or MC known or suspected to be at the site; 2) current and future reasonably anticipated or proposed uses of the real property; and 3) actual, potentially complete, or incomplete exposure pathways that link them.

The CSM is presented in a series of information profiles that provide information about the site. The information profiles are included in Table 5.9-1 below.

Table 5.9-1: Conceptual Site Model Information Profiles – Skeet/Trap Range

Profile Type	Information Needs	Preliminary Assessment Findings
Range Profile	Installation Name	Detachment Fallbrook
	Installation Location	Detachment Fallbrook is located 53 miles north of San Diego in northern San Diego County, CA.
	Range Name	Skeet/Trap Range
	Range Location	The Skeet/Trap Range is located in the central plateau of the installation, near the eastern border
	Range History	The Skeet/Trap Range was used from 1950 to 1987. It was used by both the Marine Security Force and other station personnel after hours for recreation.
	Range Area and Layout	The Skeet/Trap Range occupies approximately 31 acres. The range was oriented for firing to the west. The firing lines and the skeet shooting equipment were located on a shelf at the top of a natural berm. No firing line was observed during the site survey.
	Range Structures	There are no structures presently on the Skeet/Trap Range.
	Range Boundaries	Map 2.1-1 shows the location of the former range. N: A line of eucalyptus trees extends north to Fallbrook Creek, approximately 40 feet away. S: Shrubs and grassland extend southwest towards Building 366, approximately 2,790 feet away. W: Trees, shrubs and grassland extend west from the small arms range towards Fallbrook Creek. E: SF Small Arms Range. Trees, shrubs and grassland extend to the eastern boundary of Detachment Fallbrook, approximately 1,390 feet away. Beyond the Detachment's boundary lies the Town of Fallbrook.
	Range Security	The Skeet/Trap Range is located on Detachment Fallbrook, which is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order, and for implementing access control policies and procedures. Access to the Skeet/Trap Range from within Detachment Fallbrook is controlled by a locked fence.

Table 5.9-1: Conceptual Site Model Information Profiles – Skeet/Trap Range

Profile Type	Information Needs	Preliminary Assessment Findings
Munitions/ Release Profile	Munitions Types	The former range was used for recreation. The munitions types used at the range were limited to 12-gauge shotgun ammunition.
	Maximum Probability Penetration Depth	Pellets dispersed from a shotgun would be deposited on the ground surface well within this zone and would not penetrate the ground surface unless disturbed.
	MEC Density	None; no evidence of MEC; small arms use only.
	MEC Scrap/Fragments	None were observed.
	Associated Munitions Constituents	The primary MC associated with shotgun ammunition is lead. Other MCs include antimony, arsenic, copper, nickel, zinc, and constituents associated with black or smokeless powder. PAHs could also be an MC if clay targets were used at the Skeet/Trap Range. PAHs in clay targets tend to be tightly bound to the matrix of the target and are not readily available to the environment. Based on discussions with installation personnel, surface soil sampling at the Skeet/Trap Range has not occurred.
	Migration Routes/Release Mechanisms	Migration of MC may occur through surface soil erosion due to runoff and wind. Future construction, excavation, and maintenance at the site are also potential release mechanisms. MC in runoff could potentially end up in surface water or sediment. MC could also potentially leach through soils or surface waters to groundwater.
Physical Profile	Climate	The climate at Detachment Fallbrook is typical of the prevailing coastal southern California Mediterranean climate and is characterized by mild winters, cool summers, and infrequent rainfall. The annual average temperature is 63 °F. Precipitation ranges from 13.7 to 17.1 inches per year, with January being the wettest month and July the driest. Summers at the installation are punctuated by the Santa Ana (offshore) winds.
	Topography	The Skeet/Trap Range is mainly flat, except for the hills on the northeastern boundary of the range.
	Geology	The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges physiomorphic province, but site-specific information was not available.

Table 5.9-1: Conceptual Site Model Information Profiles – Skeet/Trap Range

Profile Type	Information Needs	Preliminary Assessment Findings
	Soil	The soil at the Skeet/Trap Range is classified as a sandy loam of granitic origin and is moderately well drained.
	Hydrogeology	No site-specific groundwater depth data were available.
	Hydrology	The Skeet/Trap Range is in the Santa Margarita watershed. The Skeet/Trap Range drains primarily into Fallbrook Creek, about 40 feet to the north and northwest of the former range's boundary.
	Vegetation	The vegetation in the area of the Skeet/Trap Range is considered to be part coastal sage scrub and part mixed grassland, with a eucalyptus grove nearby. Common species in coastal sage scrub habitat include coastal sagebrush, flat-topped buckwheat, laurel sumac, sage, goldenbush, and native grasses. Common species in mixed grassland habitat are mostly native, perennial bunch grasses, mixed with nonnative annuals.
Land Use and Exposure Profile	Current Land Use	The Skeet/Trap Range is closed and is no longer in use.
	Current Human Receptors	Navy personnel and Navy-permitted visitors (including contractors).
	Current Activities (frequency, nature of activity)	Activities at the range may include environmental and ecological surveys.
	Potential Future Land Use	There is no change in land use currently planned.
	Potential Future Human Receptors	Navy personnel and Navy-permitted visitors (including contractors).
	Potential Future Land Use-Related Activities:	Potential future land use activities must address the issue of proximity and follow any Navy ESQD Arc waivers or exemptions. Other future activities at the range could include environmental and ecological surveys.
	Zoning/Land Use Restrictions	ESQD Arcs restrictions from nearby magazines would apply to the area of the former Skeet/Trap Range. The range was operated under an exemption of the restrictions when it was in use.

Table 5.9-1: Conceptual Site Model Information Profiles – Skeet/Trap Range

Profile Type	Information Needs	Preliminary Assessment Findings
	Demographics/Zoning	<p>The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. Demographic data include the following:</p> <ul style="list-style-type: none">• Town of Fallbrook: Population (U.S. Census, 2000): 29,100• San Diego County: Population (U.S. Census, 2000): 2,813,833
	Beneficial Resources	<p>The on-site coastal sage scrub vegetation, grasslands, and the nearby eucalyptus grove offer roosting, foraging, and nesting resources for raptors.</p>
Ecological Profile	Habitat Type	<p>The types of habitats associated with the Skeet/Trap Range include coastal sage scrub, mixed grasslands, and eucalyptus.</p>
	Degree of Disturbance	<p>There are no current activities at the disposal site. Potential future activities at the site, such as environmental and ecological surveys, may disturb habitat and/or ecological receptors known or potentially present within the site.</p>
	Ecological Receptors	
	General:	<p>Common fauna included mammals (voles, weasels, mice, ground squirrels, jackrabbits, and coyotes), reptiles (orange-throated whiptails, rattlesnakes, and horned lizards), and birds (burrowing owls, kingbirds, flycatchers, and hawks).</p>
	Federal Endangered Species:	<p>Least Bell's vireo and Stephens' kangaroo rat</p>
	Federal Threatened Species:	<p>Coastal California gnatcatcher</p>
	State Endangered Species:	<p>Least Bell's vireo</p>
	State Threatened Species:	<p>Stephens' kangaroo rat</p>

Table 5.9-1: Conceptual Site Model Information Profiles – Skeet/Trap Range

Profile Type	Information Needs	Preliminary Assessment Findings
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	Potential human receptors at the site include Navy personnel, visitors, and private contractors. Ecological receptors may come into direct contact with MC in soil and/or surface water while foraging or burrowing. Ecological receptors may also come into contact with MCs that have been incorporated into the food chain (bioaccumulated in plants and prey).

A key element of the CSM is the exposure pathway analysis, which is performed separately for MEC and for MC.

For MEC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MEC are expected to be found); 2) access (e.g., controlled or uncontrolled access, items on the surface or within the subsurface); 3) an activity (e.g., non-intrusive grounds maintenance or intrusive construction); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, authorized visitors, or ecological receptors). It is important to recognize that environmental mechanisms (e.g., erosion) and/or human intervention may result in the repositioning of MEC.

For MC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MC are expected to be found); 2) an exposure medium (e.g., surface soil); 3) an exposure route (e.g., dermal contact); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, authorized visitors, or ecological receptors). If the point of exposure is not at the same location as the source, the pathway may also include a release mechanism (e.g., volatilization) and a transport medium (e.g., air).

The potential interactions between the source and receptors are assessed differently between MEC and MC. For MC, interaction between the source and receptors involves a release mechanism for the MC, an exposure medium that contains the MC, and an exposure route that places the receptor into contact with the contaminated medium. For MEC, interaction between the potential receptors and an MEC source has two components. The receptor must have access to the source and must engage in some activity that results in contact with individual MEC items within the source area.

MEC Interactions and Pathway Analysis

No exposure pathway analysis for MEC was prepared for the Skeet/Trap Range because it is not suspected to contain MEC. Historical and visual evidence indicate that MEC are not present at the Skeet/Trap Range. The site was a small arms range and no evidence has been found that would indicate MEC at the site.

MC Interactions and Pathway Analysis

The exposure pathway analysis for MC is shown in Figure 5.9-4. Potential receptors include both human (Navy personnel and contractor/visitor) and ecological receptors (biota) that may come in contact with MC in the source medium or other potentially contaminated media from the site. Pathways are shown for each medium and are discussed below. For MC, interaction between the source (e.g., the berm) and receptors generally involves a release mechanism for the MC (e.g., runoff to surface water, uptake into the food chain), an exposure medium containing the MC (e.g., soil, surface water, sediment), and an exposure route (e.g., incidental ingestion, dermal contact) that places the receptor into contact with the contaminated medium.

Surface Water/Sediment

Fallbrook Creek is about 40 feet from the northwestern border of the Skeet/Trap Range. This creek and its tributaries are used for fish and wildlife enhancement, and for wildfire protection. The exposure pathway for surface water and/or sediment is considered potentially complete for human receptors, through dermal contact and for biota (wildlife) living in or near the creek and its tributaries. Navy personnel and contractors may be exposed during site investigations or from potential future land use changes that may require construction. Biota on the site may disturb the sediment through nesting or feeding. MC could affect biota that might ingest the potential MC or absorb it through dermal contact. There is a potentially complete pathway for the general public for any MC that flows out of the installation through the surface water system.

Plant/Animal Uptake

Potentially complete pathways are indicated for biota (wildlife) exposed to MC at the Skeet/Trap Range via the food chain. MC may be taken up by plants and prey and consumed by animals at the former range.

Surface Soil

Potentially complete pathways exist for all receptors (except for the general public) via all exposure routes for surface soil contaminated with MC at the Skeet/Trap Range. It is possible that MC exists in the surface soil (i.e., 0 to 2 feet below ground surface). Exposures to humans and biota from inhalation of dust are anticipated due to the low vegetative cover on the existing soils and the dry climate. Any future movement or grading of surface soils could make MC available for wind distribution and subsequent inhalation.

Subsurface Soil

The potential for subsurface soil impacts at the Skeet/Trap Range is considered to be low, as the contaminants associated with small arms ammunition and range activities are not likely to migrate to subsurface soil. The subsurface soil exposure pathway is considered to be potentially complete for biota and for Navy personnel and contractors. Biota might come into contact with the contaminated soil by burrowing and/or ingesting. Navy personnel and contractors might engage in excavation or drilling activities during environmental investigations or ecological surveys.

Groundwater

Potentially complete pathways for Navy personnel and contractors/visitors are indicated for groundwater contaminated with MC at the Skeet/Trap Range. Navy personnel and contractors/visitors may come into contact with groundwater during environmental investigations (i.e., monitoring well installation and sampling) at the former range. The potential for groundwater impacts is considered to be incomplete for all other receptors.

An exposure pathway does not exist for MC volatilizing into the air for all receptors.

5.9.12. Summary

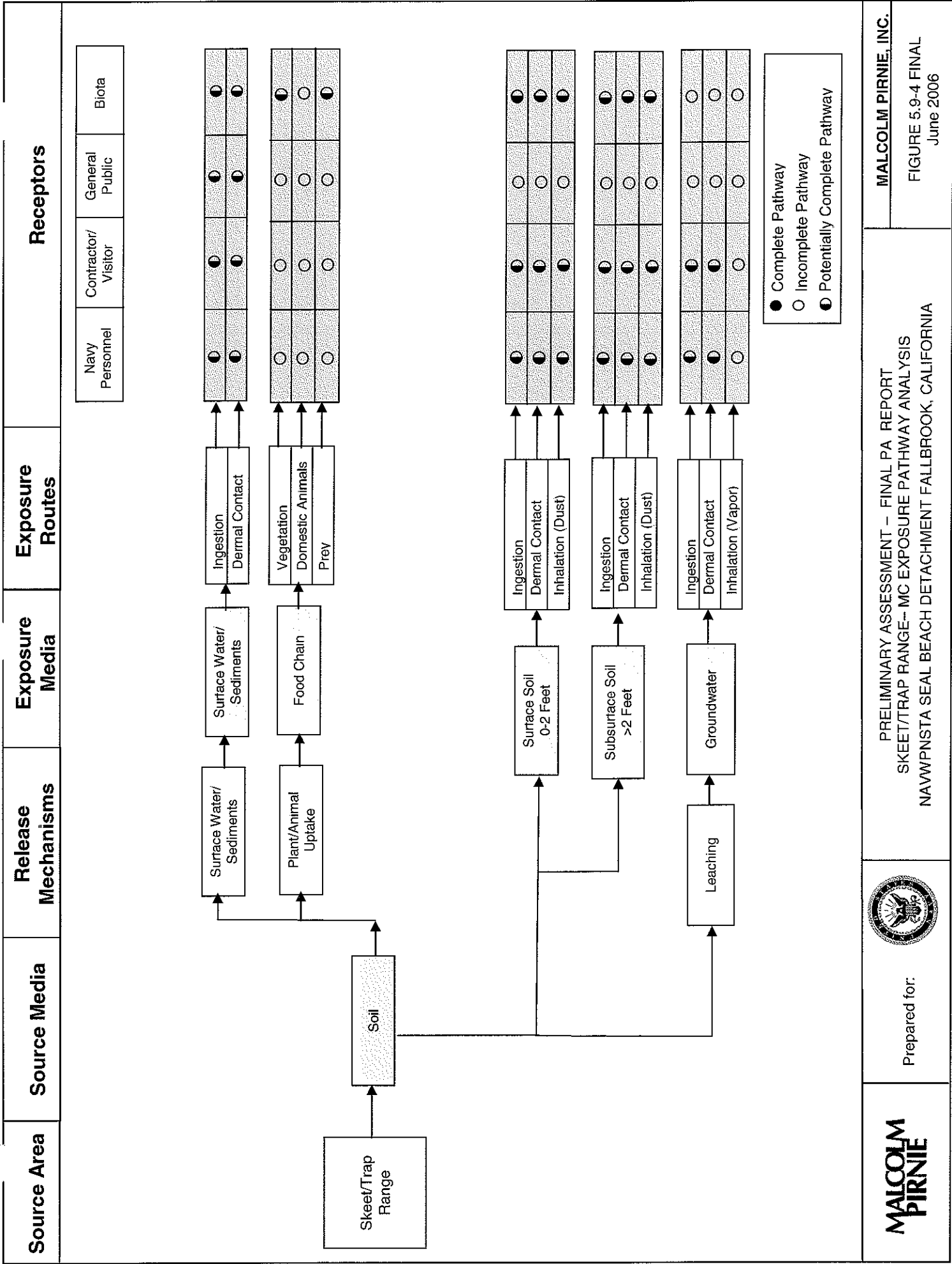
The 31-acre Skeet/Trap Range is located in the central plateau of Detachment Fallbrook, near the eastern border. The site is bordered to the east by the SF Small Arms Range. The Skeet/Trap Range was a recreational skeet/trap range that was used by the Marine Security Forces and other station personnel after work hours from 1950 to 1987. Munitions use at the range was limited to 12-gauge shotgun ammunition according to interviewees. The firing lines and the skeet shooting equipment were located on a shelf at the top of a hill. No evidence of MEC was found at the

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former range The potential for MC exists at the site, specifically lead and PAHs The area is not currently in use

5.9.13. Recommendations

Based on the data collected and presented in this PA, NFA for MEC is recommended at the Skeet/Trap Range MEC is not anticipated at skeet/trap ranges An SI is recommended at the Skeet/Trap Range with respect to MC During the SI, it is recommended that surface and subsurface soil be sampled and analyzed for the full spectrum of metals and for PAHs.





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Detachment Fallbrook, California

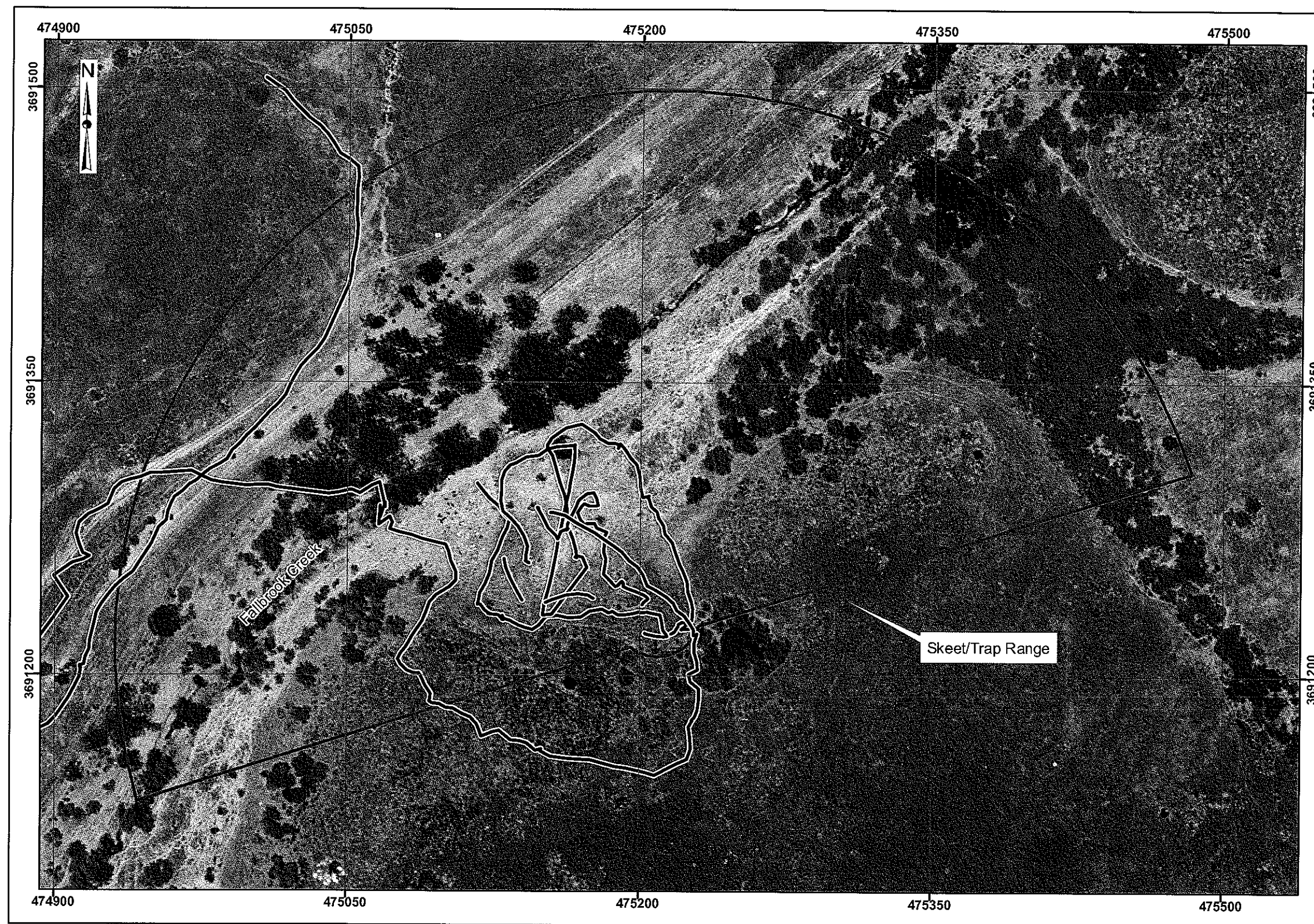


MALCOLM
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Map 5.9-1
Visual Survey
Skeet/Trap Range

Legend

-  Skeet/Trap Range
-  Site Reconnaissance Path



0 50 Meters

Data Source: Anteon Corporation,
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Map 5.9-2
Site Details
Skeet/Trap Range

Legend

-  Skeet/Trap Range
-  Streams
-  Firing Line
-  Topographic Contours (ft above MSL)

0 Meters

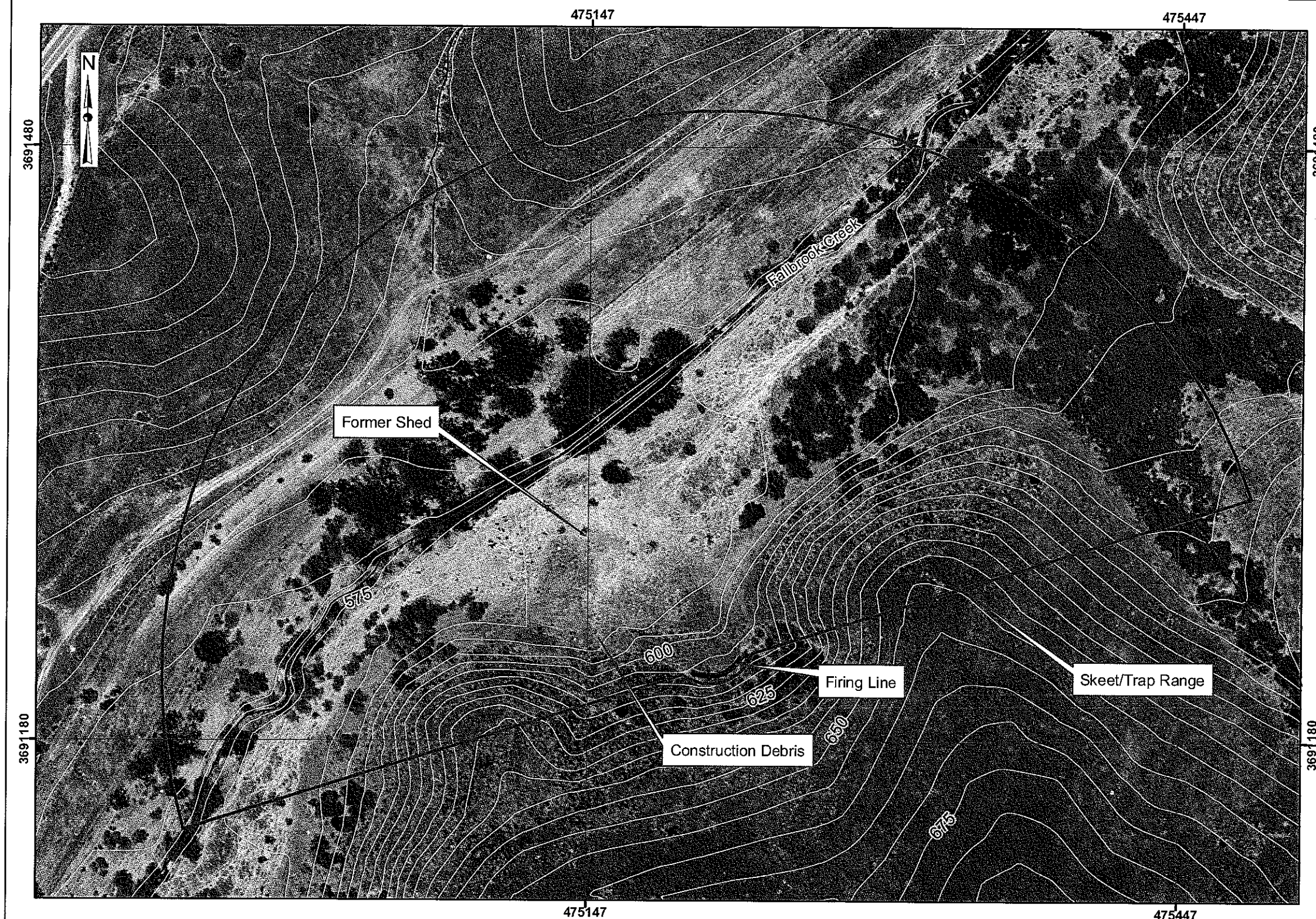


Data Source: Anteon Corporation,
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NAWPNSTA Seal Beach
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Skeet/Trap Range



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Detachment Fallbrook, California



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Map 5.9-3
Munitions Characterization
Skeet/Trap Range

Legend


 Skeet/Trap Range

MEC Presence*

 Known

 Suspect

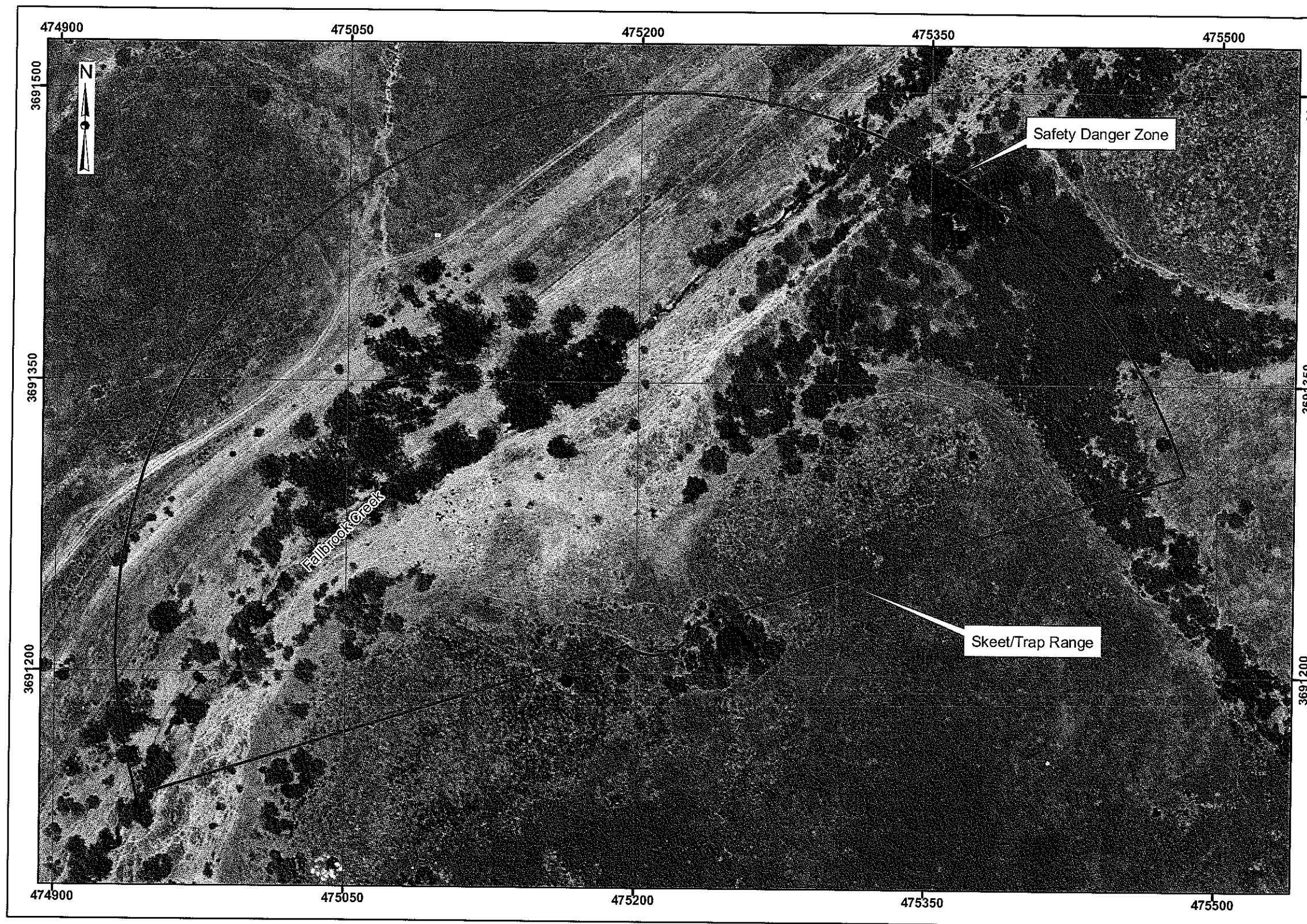
* There is no evidence of MEC presence as determined through historical documentation, interview, and visual survey. Visual observations and/or historical documentation indicate that MC may be present at the site, but MC Presence has not been confirmed by sampling or other means.

0 50 100 Meters


Data Source: Anteon Corporation,
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006



5.10. Depot Lake

Depot Lake is a 12-acre artificial lake on the western part of Detachment Fallbrook. It is located just north of Terriea Road and between buildings 763 and 736. Neither building is currently being used. Map 2.1-1 shows the location of the lake on Detachment Fallbrook and its boundaries.

5.10.1. History and Site Description

Depot Lake was constructed sometime after 1944. The lake is fed by two tributaries from the north and east and is held by an earthen dam at the southern end. Water is released from the lake by a spillway running beneath Terriea Road to the south. The lake was identified as a disposal site for munitions in a 1958 memorandum. The 1958 memorandum from the officer in charge to the commanding officer states that certain munitions (20-mm, 40-mm, and 60-mm cartridges, and 7.2-inch projector charges) were dumped into “Main lake and West lake” during WWII. According to Mr. Robbie Knight, Natural Resource Manager, Main Lake referred to in the memorandum is currently known as Depot Lake. It states that other types of munitions may have been dumped, and that munitions had been recovered from the lake in the past during dry summer seasons. The same memorandum requests that EOD technicians perform diving operations at the lake to salvage MEC. No records were found to indicate whether diving operations took place or whether additional munitions were found in the lake. Personnel interviewed during the site visit stated that before 1953 the Marine Security Forces might have dumped unexpended shells into the lake instead of turning them in to be inventoried. Currently, Depot Lake is used to store water on the installation for fish and wildlife enhancement, and for wildfire protection. The fire department (Station 9) uses a helicopter and bucket method to remove water from Depot Lake. The bucket holds 300 gallons of water and only goes down 4 feet into the water. This action is performed on average twice a year during wildfire season. The water is only used to fight fires inside Detachment Fallbrook. The lake has been used in the past for recreational boating and fishing (strict catch and release policy). As of 2004, all recreational activities were discontinued at Depot Lake.



Figure 5.10-1: Photograph was taken during the March 2005 on-site visual survey. View is of Depot Lake looking north.

5.10.1.1. Topography and Bathymetry

Depot Lake is surrounded by level terrain with hills to the north. Specific bathymetry for the lake is unknown. For further information on the topography of Detachment Fallbrook, see section 3.2.

5.10.1.2. Geology

The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges geomorphic province, but site-specific information for Depot Lake was not available. No data from soil borings are available. Section 3.3 includes a general description of the geology of Detachment Fallbrook.

5.10.1.3. Soil and Vegetation Types

Soils surrounding Depot Lake and the sediment in the lake are classified as coarse sandy loam of granitic origin. Section 3.4 includes a general description of the soil types at Detachment Fallbrook.

The vegetation in the vicinity of Depot Lake is considered to be riparian surrounded by mixed grassland to the north and east and coastal sage scrub to the south and west. Common species associated with riparian habitat include mulefat (*Baccharis salicifolia*) with some arroyo willows (*Salix lasiolepis*) and elderberry (*Sambucus mexicana*). Mixed grassland habitat typically includes native, perennial bunch grasses such as *Nassella* spp. mixed with nonnative annuals.

Common species associated with coastal sage scrub habitat include coastal sagebrush (*Artemisia californica*), flat-topped buckwheat (*Eriogonum fasciculatum*), laurel sumac (*Malosma laurina*), sage (*Salvia* spp.), goldenbush (*Isocoma menziesii*), and native grasses (*Nassella* spp.). The 1996 Integrated Natural Resources Management Plan for Detachment Fallbrook reports that fenced enclosures have been built around sensitive riparian areas at Depot Lake. Section 3.5 includes a general description of the vegetation types at Detachment Fallbrook.

5.10.1.4. Hydrology

Depot Lake is within the Santa Margarita Watershed. The surrounding area drains into Depot Lake. The lake is fed by two tributaries from the north and east and held by an earthen dam at the southern end. The lake is approximately 4 to 10 feet deep in the summer months and 6 to 18 feet deep in the winter months. It holds more than 10 acre per foot of water. Water is released from the lake by a spillway running beneath Terriea Road to the south. The spillway releases the lake water into an intermittent stream that connects with the Santa Margarita River outside the installation boundaries. Section 3.6 includes a general description of the hydrology at Detachment Fallbrook.

5.10.1.5. Hydrogeology

No site-specific groundwater depth data were available. Section 3.7 includes a general description of the hydrogeology at Detachment Fallbrook. Section 3.8 describes the status of water rights as it relates to Depot Lake.

5.10.1.6. Cultural and Natural Resources

The data collection team for Depot Lake found documentation of a milling site near the lake. To preserve the integrity of the cultural resource, more specific information is not included in this document. The 1996 Integrated Natural Resources Management Plan reports the presence of sensitive riparian vegetative communities surrounding Depot Lake. Section 3.9 includes a general description of the cultural and natural resources at Detachment Fallbrook.

5.10.1.7. Endangered and Special Status Species

Threatened and endangered species data for Detachment Fallbrook are presented in Section 3.10. The 1996 Integrated Natural Resources Management Plan lists the Least Bell's vireo, arroyo toad, and the coastal California gnatcatcher as protected species that are known to or have the potential to inhabit the vegetation surrounding the site.

5.10.2. Visual Survey Observations and Results

A visual survey of Depot Lake was conducted on March 9, 2005. During the visual survey, the following Malcolm Pirnie team members were present: Mr. Chip Poalinelli, Mr. Dan Hains, and Mr. Scott Lehman. The field team conducted the visual survey by walking along the southern and western shores of the lake. Figure 5.10-1 is a photograph of the lake taken during the March 2005 survey.

A visual depiction of the site reconnaissance is provided on Map 5.10-1 located at the end of Section 5.10. Additional details are illustrated on Map 5.10-2 also located at the end of Section 5.10.

5.10.3. Munitions and Munitions Related Materials Associated with the Site

This section describes the munitions or munitions related materials, including the types and estimated maximum penetration depths, known or suspected to be at the former range. This includes both MEC and non-hazardous munitions related scrap (e.g., fragments, base plates, and inert mortar fins). Potential ordnance concentration areas are presented along with a discussion on the presence of special consideration munitions.

According to historical records, the munitions that might be found in Depot Lake include 20-mm, 40-mm, and 60-mm cartridges and 7.2-inch projector charges. The available technical data sheets on these items are included in Appendix D. Other unknown munitions may also have been disposed of in the lake.

Based on the information obtained during the data collection process, Depot Lake is not suspected to contain CWM filled munitions, electrically fused munitions, or DU associated munitions.

5.10.4. MEC Presence

The entire site has been categorized into one of three levels of MEC presence including: Known MEC Areas, Suspect MEC Areas, and Areas where No Evidence exists to indicate that MEC is known or is suspected to be at the site. The MEC presence is discussed below.

Map 5.10-3 illustrates the munitions characterization of the Depot Lake and is provided at the end of Section 5.10.

5.10.4.1. Known MEC Areas

There are no Known MEC Areas associated with Depot Lake.

5.10.4.2. Suspected MEC Areas

Depot Lake is a Suspected MEC Area. The site is expected to have a medium MEC density; however, some areas of the site will have a higher or lower density depending on disposal practices.

5.10.4.3. Areas Not Suspected to Contain MEC

Until further investigations are completed, Depot Lake is suspected to contain MEC.

5.10.5. Ordnance Penetration Estimates

Penetration from firing would not be a factor at Depot Lake because historical records indicate that munitions were dumped into the lake. MEC at Depot Lake could be buried or partially buried in the sediment below the water surface. The depth of MEC burial would depend on sediment loading.

5.10.6. Munitions Constituents

Based on historical records, the primary MCs are PBX, zirconium pellets, RDX, black powder, HMX, beryllium, cobalt, copper, lead, manganese, lead azide, lead styphnate, phosphorus, antimony sulfide, zinc, zinc stearate, aluminum, cadmium, chromium, copper salt, cumene hydroperoxide, methyl chloroform, sodium nitrate, toluene, triethylamine, xylenes, 2-ethoxyethylacetate, lead chromate (VI), lead naphthenate, and zinc phosphate (from 20-mm, 40-mm, and 60-mm cartridges), and TNT, RDX, lead, and aluminum (from 7.2-inch projector charges).

5.10.7. Contaminant Migration Routes

Migration of MEC and MC may occur through sediment transport and deposition. Future construction, excavation, and maintenance at the site are also potential release mechanisms. MC could leach from the munitions into the water and sediments. MC may flow out of the lake and off of the installation through the surface water system. Potentially contaminated lake water could also migrate during its use for wildfire suppression. Lake water contaminated with MC might infiltrate into the groundwater.

5.10.8. Receptors and Pathways

Human receptors at Depot Lake include Navy personnel and Navy-permitted visitors (including contractors). Ecological receptors (including benthic aquatic life) may come into direct contact with MC in the sediment and/or water. Ecological receptors may also come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and prey). The general public (including MCB Camp Pendleton military personnel and civilians) could also come into contact with MC flowing out of the lake and off of the installation base through the surface water system.

5.10.8.1. Nearby Populations

Fallbrook and San Diego County have populations of 29,100, and 2,813,833, respectively (U.S. Census Bureau, 2000). The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. Depot Lake is approximately 10,820 feet from the housing complex at the installation. See Section 2.1 for more information on the housing complex.

5.10.8.2. Buildings Near/Within Site

There are no buildings in or on the shores of Depot Lake. The nearest building is approximately one mile to the northeast.

5.10.8.3. Utilities On/Near Site

There are no utilities running under or over Depot Lake. U.S. government phone lines are located approximately 0.2 miles (1,056 feet) from the lake's northern, eastern, and southern extents. Phone lines are located on all four sides of the lake, ranging from 0.1 miles (528 feet) to the southeast to 0.4 miles (2,112 feet).

5.10.9. Land Use

Depot Lake is mostly used to store water on the installation for fish and wildlife enhancement, and for wildfire protection. Depot Lake has also been used occasionally for recreational fishing by boat and wading by installation personnel and visitors. As of 2004, all recreational activities were discontinued at Depot Lake.

5.10.10. Access Controls / Restrictions

Detachment Fallbrook is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order, and for implementing access control policies and procedures. Once inside the installation, Depot Lake is located inside a controlled area. Portions of Depot Lake are fenced to protect habitat around the lake.

5.10.11. Conceptual Site Model

This CSM was developed following guidance documents issued by the USEPA for hazardous waste sites and the U.S. Army Corps of Engineers (USACE) for OE sites. Guidance documents used in the development of this CSM include the USEPA’s Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA/540/G-89/004) and the Final USACE CSM Guidance Development of Integrated Conceptual Site Models for Environmental OE Sites (USACE, 2003).

The CSM describes the site and its environmental setting, and presents information regarding: 1) MEC and/or MC known or suspected to be at the site; 2) current and future reasonably anticipated or proposed uses of the real property; and 3) actual, potentially complete, or incomplete exposure pathways that link MEC and/or MC to receptors.

The CSM is presented in a series of information profiles that provide information about the site. The information profiles are included in Table 5.10-1 below.

Table 5.10-1: Conceptual Site Model Information Profiles – Depot Lake		
Profile Type	Information Needs	Preliminary Assessment Findings
Range Profile	Installation Name	NAVWPNSTA Seal Beach Detachment Fallbrook
	Installation Location	Detachment Fallbrook is located 53 miles north of San Diego in northern San Diego County, CA.
	Range Name	Depot Lake
	Range Location	Depot Lake is in the western portion of the installation.

Table 5.10-1: Conceptual Site Model Information Profiles – Depot Lake		
Profile Type	Information Needs	Preliminary Assessment Findings
	Range History	Depot Lake was constructed sometime after 1944. A 1958 memorandum from the officer in charge to the commanding officer states that certain munitions were dumped into the lake during WWII. It also stated that other types of munitions may have been dumped, and that munitions had been recovered from the lake in the past during dry summer seasons.
	Range Area and Layout	Depot Lake covers approximately 12 acres. The lake is fed by two tributaries from the north and east and held by an earthen dam at the southern end. Water is released from the lake by a spillway running beneath Terriea Road to the south.
	Range Structures	There are no structures currently in or on the shores of Depot Lake.
	Range Boundaries	Map 2 1-1 shows the location of Depot Lake N: Coastal sage scrub extends north of the lake S: Terriea Road follows the shoreline of the lake on the south and west. A spillway under Terriea Road to the south is used to release water from Depot Lake. Magazines are located within 200 feet south of the lake. W: Terriea Road follows the shoreline of the lake on the south. Magazines are located within 850 feet west of the lake. E: The northeast portion of the lake is bounded by grassland. Magazines are located within 200 feet east of the lake.
	Range Security	Detachment Fallbrook is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order, and for implementing access control policies and procedures. Once inside the installation, Depot Lake is located inside a controlled area. Portions of Depot Lake are fenced to protect habitat around the lake.
Munitions/ Release Profile	Munitions Types	Historical records indicate that 20-mm, 40-mm, and 60-mm cartridges, 7.2-inch projector charges, and potentially other munitions were dumped into the lake during WWII.
	Maximum Probability Penetration Depth	Penetration from firing is not a factor at Depot Lake. MEC at Depot Lake could be partially buried in the sediment below the water surface. The depth of MEC would depend on sediment loading.

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Table 5.10-1: Conceptual Site Model Information Profiles – Depot Lake

Profile Type	Information Needs	Preliminary Assessment Findings
	MEC Density	Depot Lake is a suspected MEC area. The site is suspected to have a medium MEC density; however, some areas of the site may have a higher or lower density depending on disposal practices.
	MEC Scrap/Fragments	The presence of MEC scrap or fragments is unknown.
	Associated Munitions Constituents	The primary MC of concern are: <ul style="list-style-type: none"> ○ 20-mm, 40-mm, and 60-mm cartridges: PBX, zirconium pellets, RDX, black powder, HMX, beryllium, chromium, cobalt, copper, lead, manganese, lead azide, lead styphnate, phosphorus, antimony sulfide, zinc, zinc stearate, aluminum, cadmium, copper salt, cumene hydroperoxide, methyl chloroform, sodium nitrate, toluene, triethylamine, xylenes, zinc phosphate, lead chromate (VI), 2-ethoxyethylacetate, and lead naphthenate; and ○ 7.2-inch projector charges: TNT, RDX, lead, and aluminum
	Migration Routes/Release Mechanisms	Migration of MEC and MC may occur through sediment transport and deposition. Future construction, excavation, and maintenance at the site are also potential release mechanisms. MC could leach from the munitions into the lake and the lake can carry contaminated water and sediments off the installation via the spillway. Potentially contaminated lake water could also migrate during its use for wildfire suppression. Lake water contaminated with MC might infiltrate into the groundwater.
Physical Profile	Climate	The climate at Detachment Fallbrook is typical of the prevailing southern California Mediterranean climate and is characterized by mild winters, cool summers, and infrequent rainfall. The annual average temperature is 63 °F. Precipitation ranges from 13.7 to 17.1 inches per year, with January being the wettest month and July the driest. Summers at the installation are punctuated by the Santa Ana (offshore) winds.
	Topography & Bathymetry	Depot Lake is surrounded by level terrain with hills to the north. Specific bathymetry for the lake is unknown.
	Geology	The region is underlain by plutonic and meta-sedimentary rocks of the Peninsular Ranges geomorphic province, but site-specific information was not available.

Table 5.10-1: Conceptual Site Model Information Profiles – Depot Lake

Profile Type	Information Needs	Preliminary Assessment Findings
	Soil	The soil surrounding Depot Lake and the sediment in the lake are classified as course sandy loam of granitic origin
	Hydrogeology	No site-specific groundwater depth data were available.
	Hydrology	Depot Lake is within the Santa Margarita watershed Depot Lake is used to store water on the installation for fish and wildlife enhancement, and for wildfire protection. The lake is approximately 4 to 10 feet deep in the summer months and 6 to 18 feet deep in the winter months. The lake is fed by two tributaries from the north and east and held by an earthen dam at the southern end. Water is released from the lake by a spillway running beneath Terriea Road to the south. The surrounding area would drain into Depot Lake
	Vegetation	The vegetation in the area of Depot Lake is considered to be riparian on the shoreline surrounded by mixed grassland to the north and east, and coastal sage scrub to the south and west. Common species in mixed grassland habitat include native, perennial bunch grasses mixed with nonnative annuals. Common species in coastal sage scrub habitat include coastal sagebrush, flat-topped buckwheat, laurel sumac, sage, goldenbush, and native grasses. Species common in riparian habitat include mulefat, arroyo willows, and elderberry.
Land Use and Exposure Profile	Current Land Use	Depot Lake is used to store water on the installation for fish and wildlife enhancement, and for wildfire protection. Depot Lake has been used for recreational fishing by Navy personnel and visitors by boat and wading. As of 2004, all recreational activities on the lake have been suspended until further investigation under IRP and MRP.
	Current Human Receptors	Navy personnel and Navy-permitted visitors (including contractors).
	Current Activities (frequency, nature of activity)	Supplying water for wildfire suppression.
	Potential Future Land Use	There is no change in land use planned.
	Potential Future Human Receptors	Navy personnel and Navy-permitted visitors (including contractors).

Table 5.10-1: Conceptual Site Model Information Profiles – Depot Lake

Profile Type	Information Needs	Preliminary Assessment Findings
	Potential Future Land Use-Related Activities:	Any potential future use activities would have to follow any Navy ESQD Arc waivers or exemptions. Other potential future activities at the range include environmental and ecological surveys.
	Zoning/Land Use Restrictions	Due to the proximity of the site to some of the installation's munitions storage bunkers, ESQD Arc restrictions apply to Depot Lake.
	Demographics/Zoning	The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. Demographic data include the following: <ul style="list-style-type: none">Town of Fallbrook: Population (U.S. Census, 2000): 29,100San Diego County: Population (U.S. Census, 2000): 2,813,833
	Beneficial Resources	Depot Lake is used wildfire protection. The 1996 Integrated Natural Resources Management Plan reports the presence of sensitive riparian vegetative communities surrounding Depot Lake. Depot Lake is surrounded by habitat for the coastal California gnatcatcher, and a management area for the Least Bell's vireo.
Ecological Profile	Habitat Type	Depot Lake is a riparian habitat and is surrounded by mixed grasslands and some coastal sage scrub habitat.
	Degree of Disturbance	Disturbance at Depot Lake is expected to be low. The lake is used as a water supply. Disturbance below the water level is expected to be minimal.
	Ecological Receptors	
	General:	Common flora/fauna includes mammals (kangaroo rats, voles, deer, mice, ground squirrels, opossum, rabbits, and coyotes), amphibians (tree frogs and bull frogs), reptiles (orange-throated whiptails, rattlesnakes, and horned lizards), and birds (burrowing owls, kites, quails, sparrows, kingbirds, and hawks). Fish species occurring in the lake include catfish, sunfish, and bass.
	Federal Endangered Species:	Arroyo toad, Least Bell's vireo, Southwestern willow flycatcher, and Stephen's kangaroo rat.

Table 5.10-1: Conceptual Site Model Information Profiles – Depot Lake

Profile Type	Information Needs	Preliminary Assessment Findings
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	Potential human receptors at the Depot Lake include Navy personnel, visitors, and private contractors. Ecological receptors may come into direct contact with MEC and/or MC in the water. Receptors may also come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and prey). There is also a potentially complete exposure pathway for the general public coming into contact with MC migrating off the installation through the surface water system.

A key element of the CSM is the exposure pathway analysis, which is performed separately for MEC and for MC.

For MEC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MEC are expected to be found); 2) access (e.g., controlled or uncontrolled access, items on the surface or within the subsurface); 3) an activity (e.g., non-intrusive grounds maintenance or intrusive construction); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, authorized visitors, or ecological receptors). It is important to recognize that environmental mechanisms (e.g., erosion) and/or human intervention may result in the repositioning of MEC.

For MC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MC are expected to be found); 2) an exposure medium (e.g., surface soil); 3) an exposure route (e.g., dermal contact); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, authorized visitors, or ecological receptors). If the point of exposure is not at the same location as the source, the pathway may also include a release mechanism (e.g., volatilization) and a transport medium (e.g., air).

The potential interactions between the source and receptors are assessed differently between MEC and MC. For MC, interaction between the source and receptors involves a release mechanism for the MC, an exposure medium that contains the MC, and an exposure route that places the receptor into contact with the contaminated medium. For MEC, interaction between the potential receptors and an MEC source has two components. The receptor must have access

to the source and must engage in some activity that results in contact with individual MEC items within the source area.

MEC Interactions and Pathway Analysis

The exposure pathway analysis for MEC is shown in Figure 5.10-2 because historical evidence indicates that MEC were disposed at Depot Lake. No MEC was observed during the visual inspection. The release mechanism of handling/treading underfoot activities is a potentially complete exposure pathway for both human receptors and biota (wildlife). Biota on the site may disturb the sediment through nesting and/or burrowing on the banks of the lake, or feeding. The release mechanism of intrusive activities (such as digging or drilling) is a potentially complete exposure pathway for both human and ecological receptors. Navy personnel and contractors may be exposed during site investigations or from potential future land use changes that may require construction.

MC Interactions and Pathway Analysis

The exposure pathway analysis for MC is shown in Figure 5.10-3. Potential receptors include both human (Navy personnel, contractor/visitor) and ecological receptors (biota) that may come in contact with MC in the source medium or other potentially contaminated media. Exposure pathways are shown for each medium and are discussed below. For MC, interaction between the source (i.e., disposed munitions) and receptors generally involves a release mechanism for the MC (e.g., runoff into the surface water or uptake into the food chain), an exposure medium containing the MC (e.g., surface water or sediment), and an exposure route (e.g., incidental ingestion or dermal contact) that places the receptor into contact with the contaminated medium.

Surface Water/Sediment

The most direct release mechanism for MC from Depot Lake is surface water and/or sediment. Because the lake is not used for drinking water, the exposure pathway for surface water and/or sediment is considered potentially complete for human receptors through dermal contact and ingestion and for biota living in or near the lake. Navy personnel and contractors may be exposed during site investigations or from potential future land use changes that may require construction. Biota on the site may disturb the sediment through nesting and/or burrowing on the banks of the lake, or feeding. Water removed during wildfire suppression actions could potentially transfer MC in the surface water from the lake onto the wildfire area. As mentioned in Section 3.7, MCB Camp Pendleton uses surface water from the Santa Margarita River Watershed for municipal and

domestic purposes. This could potentially affect both civilians and military personnel at MCB Camp Pendleton. The general public could also come into contact with MC migrating off the installation through the surface water system.

Plant/Animal Uptake

Potentially complete pathways are indicated for biota (wildlife) exposed to MC at Depot Lake via the food chain. MC may be taken up by plants and prey and consumed by animals (wildlife) at the lake.

Groundwater

Potentially complete pathways for Navy personnel and contractors/visitors are indicated for groundwater contaminated with MC at and near Depot Lake. Navy personnel and contractors/visitors may come into contact with groundwater during environmental investigations (i.e. monitoring well installation and sampling) at and near the lake. As mentioned in Section 3.7, MCB Camp Pendleton extracts and uses groundwater from the Santa Margarita Watershed; this could potentially affect both civilians and military personnel at MCB Camp Pendleton. The potential for groundwater impacts is considered to be incomplete for all other receptors.

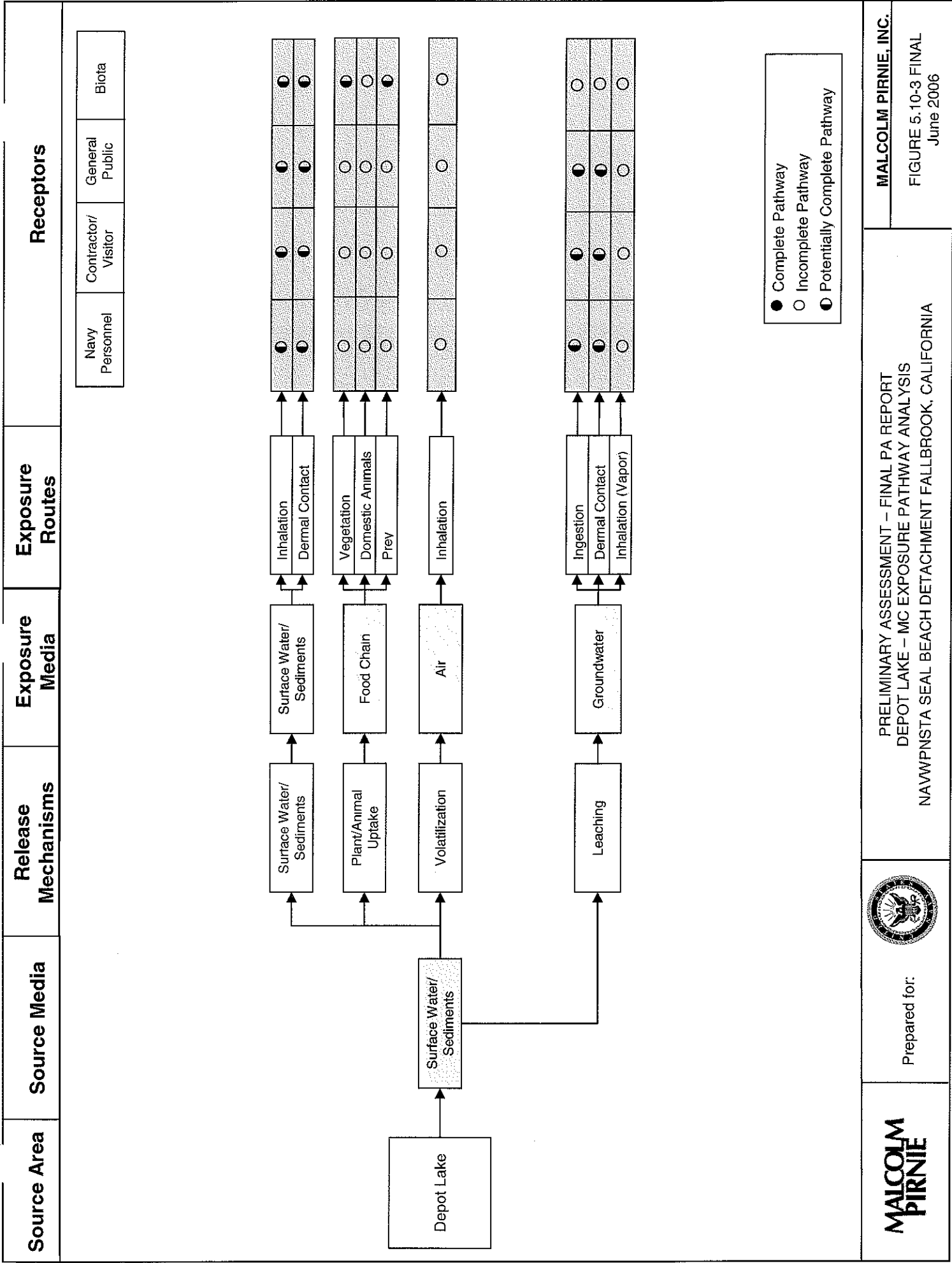
An exposure pathway does not exist for MC in the air, surface soil, and subsurface soil for any receptors.

5.10.12. Summary

Depot Lake is a 12-acre artificial lake which historical records indicate was used for munitions (20-mm, 40-mm, and 60-mm cartridges and 7.2-inch projector charges) disposal during WWII. Records show that other types of munitions may have been dumped as well, and that, during past dry summer seasons, munitions have been recovered from the lake. Depot Lake is used to store water on the installation for fish and wildlife enhancement, and for wildfire protection. Potential receptors include Navy personnel, Navy-permitted visitors, and ecological receptors. Though no munitions or munitions scrap were observed during the site visit in March 2005, the lake is suspected to contain MEC and MC.

5.10.13. Recommendations

Based on the data collected and presented in this PA, an SI is recommended for both MEC and MC at Depot Lake.





Preliminary Assessment
NAWPNSTA Seal Beach
Detachment Fallbrook, California

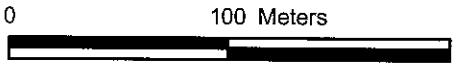


**MALCOLM
PIRNIE**

Map 5.10-1
Visual Survey
Depot Lake

Legend

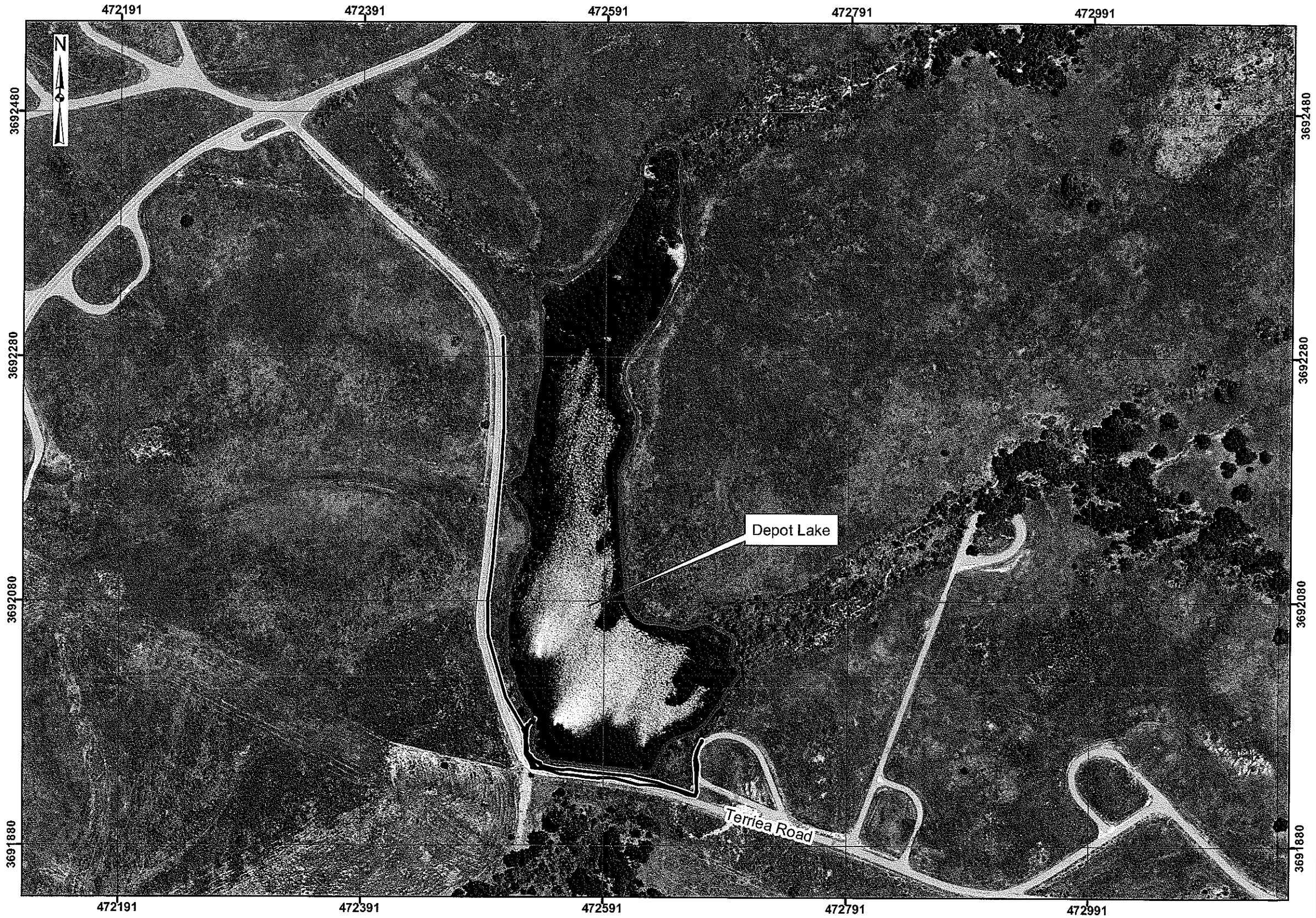
-  Site Reconnaissance Path
-  Depot Lake



Data Source: Anteon Corporation,
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006






Preliminary Assessment
NAVWPNSTA Seal Beach
Detachment Fallbrook, California

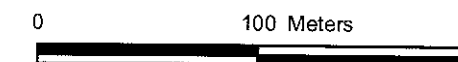


**MALCOLM
PIRNIE**

Map 5.10-2
Site Details
Depot Lake

Legend

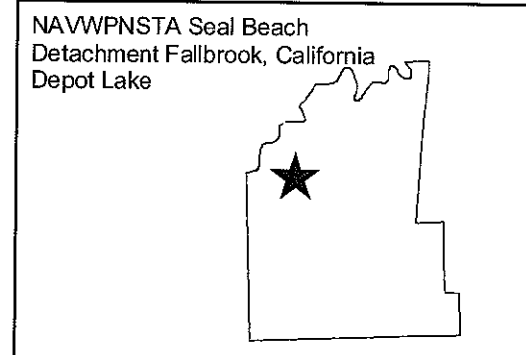
-  Depot Lake
-  Streams
-  Topographic Contours
(ft above MSL)



Data Source: Anteon Corporation,
Ortho photo, June 3, 2004
NAVWPNSTA Seal Beach GIS Data,
Vector Contour Data

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

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Preliminary Assessment
NAWPNSTA Seal Beach
Detachment Fallbrook, California



**MALCOLM
PIRNIE**

Map 5.10-3
Munitions Characterization
Depot Lake

Legend

 Depot Lake

MEC Presence*

 Known

Suspect

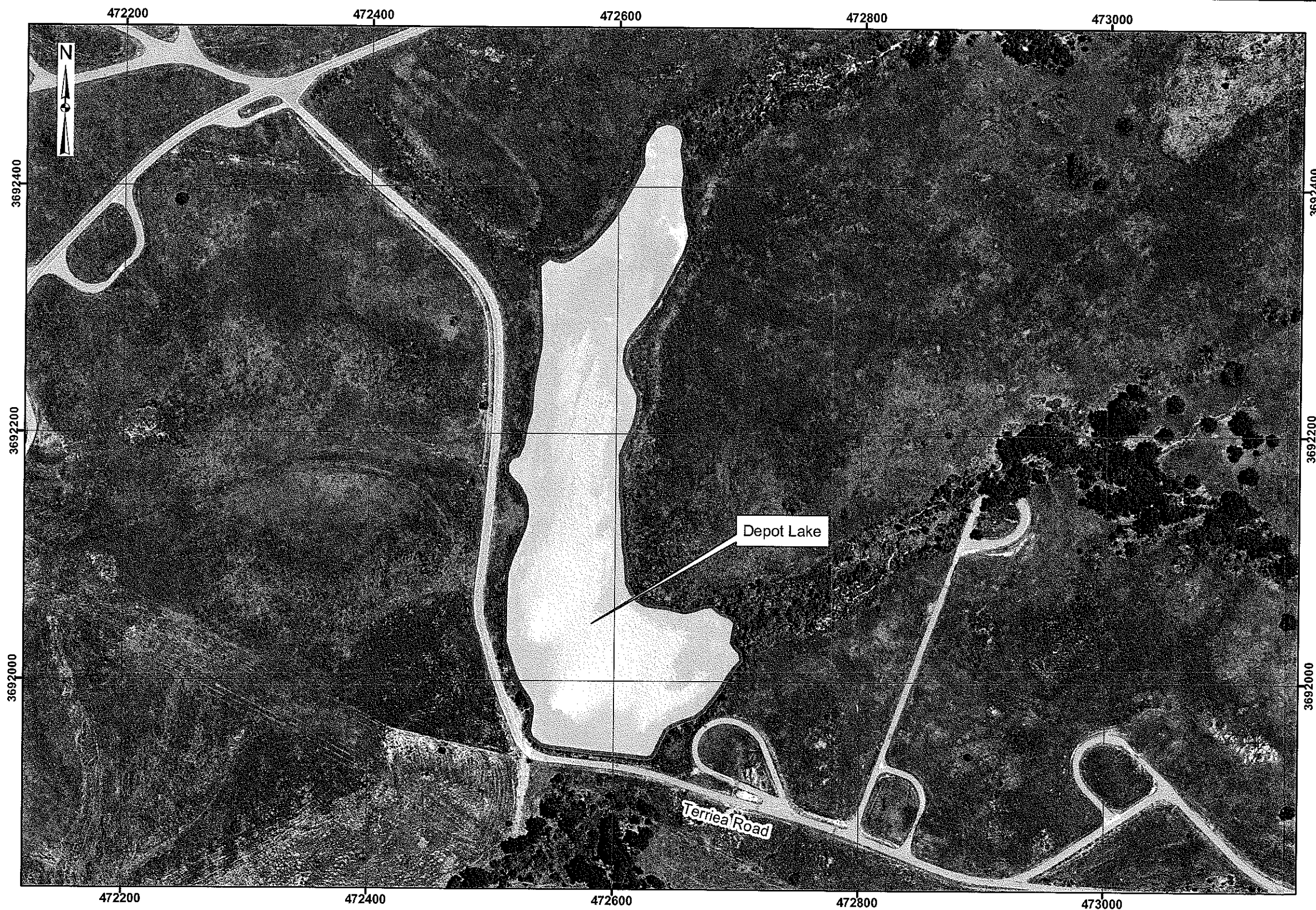
*MEC Presence was determined
through review of historical documentation,
interviews, and visual survey.

0 100 200 Meters


Data Source: Anteon Corporation,
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
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5.11. Lower Lake

Lower Lake is a 3-acre artificial lake on the southwestern part of Detachment Fallbrook, approximately 300 feet north of Shaik Road and just west of the Group 13 magazines. Map 2.1-1 shows the location of the lake on Detachment Fallbrook and its boundaries.

5.11.1. History and Site Description

Lower Lake is an artificial lake created prior to development of the installation. The lake is fed by tributaries from the north, east, and west and held by an earthen dam at the western end. The lake was identified as a disposal site for munitions in a 1958 memorandum. The 1958 memorandum from the officer in charge to the commanding officer states that certain munitions (20-mm, 40-mm, and 60-mm cartridge, and 7.2-inch projector charges) were dumped into two lakes during WWII, and that other types of munitions may also have been dumped into the lake. According to Mr. Knight, Natural Resource Manager, Lower Lake is one of the lakes referred to in the memorandum. The 1958 memorandum states that munitions had been recovered from the lake in the past during dry summer seasons. The same memorandum requests that EOD technicians perform diving operations at the lake to salvage MEC. No records were found to indicate whether diving operations took place or whether additional munitions were found in the lake. Personnel interviewed during the site visit stated that before 1953 the Marine Security Forces might have dumped unexpended shells into the lake instead of turning them in to be inventoried. Currently, Lower Lake is used to store water on the installation for fish and wildlife enhancement, and for wildfire protection. The fire department (Station 9) uses a helicopter and bucket method to remove water from Lower Lake. The bucket holds 300 gallons of water and only goes down 4 feet into the water. This action is performed on average twice a year during wildfire season. The water is only used to fight fires inside Detachment Fallbrook. From this description, it would not appear that the bucket method would significantly disturb the sediments in the lakes. The lake has also been used for recreational boating and fishing (strict catch and release policy). As of 2004, all recreational activities were discontinued at Lower Lake.

5.11.1.1. Topography and Bathymetry

The area surrounding Lower Lake contains low hills. Specific bathymetry for Lower Lake is unknown. For further information on the topography of Detachment Fallbrook, see section 3.2.

5.11.1.2. Geology

The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges geomorphic province, but site-specific information for Lower Lake was not available. Section 3.3 includes a general description of the geology of Detachment Fallbrook.



**Figure 5.11-1: Photograph was taken during the March 2005 on-site visual survey.
View of Lower Lake.**

5.11.1.3. Soil and Vegetation Types

Soils surrounding Lower Lake and the sediment in the lake are classified as coarse sandy loam of granitic origin. Section 3.4 includes a general description of the soil types at Detachment Fallbrook.

The vegetation in the area of Lower Lake is considered to be riparian surrounded by mixed grassland to the south and east and coastal sage scrub to the north and west. Species commonly associated with riparian habitat include mulefat (*Baccharis salicifolia*), arroyo willows (*Salix lasiolepis*), and elderberry (*Sambucus mexicana*). Mixed grassland habitat typically includes native, perennial bunch grasses such as *Nassella* spp. mixed with nonnative annuals. Common species associated with coastal sage scrub include coastal sagebrush (*Artemisia californica*), flat-topped buckwheat (*Eriogonum fasciculatum*), laurel sumac (*Malosma laurina*), sage (*Salvia*

spp.), goldenbush (*Isocoma menziesii*), and native grasses (*Nassella* spp.). Section 3.4 includes a general description of the vegetation types at Detachment Fallbrook.

5.11.1.4. Hydrology

Lower Lake is within the Santa Margarita River watershed. The lake is fed by streams from the north, east, and west and held by an earthen dam at the western end. The dam releases the lake water into an intermittent stream that feeds Lake O'Neill on MCB Camp Pendleton. The lake is approximately 8 to 16 feet deep during the summer months and 12 to 25 feet during the winter months. It holds less than 10 acres per foot of water. Section 3.5 includes a general description of the hydrology at Detachment Fallbrook.

5.11.1.5. Hydrogeology

No site-specific groundwater depth data were available. Section 3.6 includes a general description of the hydrogeology at Detachment Fallbrook. Section 3.7 describes the status of water rights at Detachment Fallbrook.

5.11.1.6. Cultural and Natural Resources

The data collection team for Lower Lake found no documentation of significant cultural resources at or near the site. Detachment Fallbrook has large areas of undisturbed land that can serve as suitable habitat to threatened and endangered species. Section 3.7 includes a general description of the cultural and natural resources at Detachment Fallbrook.

5.11.1.7. Endangered and Special Status Species

Threatened and endangered species data for Detachment Fallbrook are presented in Section 3.8. The 1996 Integrated Natural Resources Management Plan lists the Least Bell's vireo and the coastal California gnatcatcher as protected species known to or having the potential to inhabit the vegetation surrounding the lake area.

5.11.2. Visual Survey Observations and Results

A visual survey of Lower Lake was conducted on March 29, 2005. During the visual survey, the following Malcolm Pirnie team members were present: Mr. Chip Poalinelli, Mr. Dan Hains, and Mr. Scott Lehman. The field team conducted the visual survey by walking the western and southern shores of the lake.

A visual depiction of the site reconnaissance is provided on Map 5 11-1 located at the end of Section 5 11. Additional details are illustrated on Map 5 11-2 also located at the end of Section 5.11

5.11.3. Munitions and Munitions Related Materials Associated with the Site

This section describes the munitions or munitions related materials, including the types and estimated maximum penetration depths, known or suspected to be at the former range. This includes both MEC and non-hazardous munitions related scrap (e.g., fragments, base plates, and inert mortar fins). Potential ordnance concentration areas are presented along with a discussion on the presence of special consideration munitions.

According to historical records, the munitions that might be found in Lower Lake include 20-mm, 40-mm, and 60-mm cartridges and 7 2-inch projector charges. Other unknown munitions may also have been dumped in the lake. The available technical data sheets on these items are included in Appendix D.

Based on the information obtained during the data collection process, Lower Lake is not suspected to contain CWM filled munitions, electrically fused munitions, or DU associated munitions.

5.11.4. MEC Presence

The entire site has been categorized into one of three levels of MEC presence including: Known MEC Areas, Suspect MEC Areas, and Areas where No Evidence exists to indicate that MEC is known or is suspected to be at the site. The MEC presence is discussed below.

Map 5 11-3 illustrates the munitions characterization of the Lower Lake and is provided at the end of Section 5.11

5.11.4.1. Known MEC Areas

There are no Known MEC Areas associated with Lower Lake.

5.11.4.2. Suspected MEC Areas

Lower Lake is a Suspected MEC Area of medium MEC density. Some areas of the lake may have a higher or lower density, depending on disposal practices.

5.11.4.3. Areas Not Suspected to Contain MEC

Until further investigations are completed, Lower Lake is suspected to contain MEC

5.11.5. Ordnance Penetration Estimates

Penetration from firing is not a factor at Lower Lake because historical records indicate that munitions were dumped into the lake. MEC at Lower Lake could be buried or partially buried in the sediment below the water surface. The depth of MEC would depend on sediment loading.

5.11.6. Munitions Constituents

Based on historical records, the primary MC are PBX, zirconium pellets, RDX, aluminum, black powder, HMX, beryllium, chromium, cobalt, copper, lead, manganese, lead azide, lead styphnate, phosphorus, antimony sulfide, zinc, zinc stearate, cadmium, copper salt, cumene hydroperoxide, methyl chloroform, sodium nitrate, toluene, triethylamine, xylenes, 2-ethoxyethylacetate, lead chromate (VI), lead naphthenate, zinc phosphate (from 20-mm, 40-mm, and 60-mm cartridges), and TNT, RDX, lead, and aluminum (from 7 2-inch projector charges)

5.11.7. Contaminant Migration Routes

Migration of MEC and MC may occur through sediment transport and deposition. Future construction, excavation, and maintenance at the site are also potential release mechanisms. MC could leach from the munitions into the lake. MC may flow out of the lake and installation through the surface water system. Potentially contaminated lake water could also migrate during its use for wildfire suppression. Lake water contaminated with MC might infiltrate into the groundwater.

5.11.8. Receptors

Human receptors at Lower Lake include Navy personnel and Navy-permitted visitors (including contractors). Ecological receptors (including benthic aquatic life) may come into direct contact with MC in the sediments and/or water. Ecological receptors may also come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and prey). The general public (including MCB Camp Pendleton military personnel and civilians) could also come into contact with MC flowing out of the lake and off of the installation base through the surface water system.

5.11.8.1. Nearby Populations

Fallbrook and San Diego County have populations of 29,100, and 2,813,833, respectively (U.S. Census Bureau, 2000). The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. Lower Lake is approximately 18,700 feet from the housing complex at the installation. See Section 2.1 for more information on the housing complex.

5.11.8.2. Buildings Near/Within Site

There are no buildings within Lower Lake. The nearest building within the installation's boundary is more than two miles to the west. Magazines are located 0.3 miles to the southeast and 0.65 miles to the northeast.

5.11.8.3. Utilities On/Near Site

There are no utilities running under or through Lower Lake. To the west along the installation border (approximately 0.4 miles) are existing firebreaks. Phone lines and U.S. government phone lines service the magazines located 0.3 miles to the southeast and 0.65 miles to the northeast.

5.11.9. Land Use

Lower Lake is mostly used to store water on the installation for fish and wildlife enhancement, and for wildfire protection. Lower Lake has also been used occasionally for recreational fishing by boat and wading by installation personnel. As of 2004, all recreational activities were discontinued at Lower Lake.

5.11.10. Access Controls / Restrictions

Detachment Fallbrook is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order, and for implementing access control policies and procedures. Once inside the installation, Lower Lake is located inside a controlled area.

5.11.11. Conceptual Site Model

This CSM was developed following guidance documents issued by the USEPA for hazardous waste sites and the USACE for OE sites. Guidance documents included the USEPA's Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA/540/G-

89/004) and the USACE CSM Guidance Development of Integrated Conceptual Site Models for Environmental OE Sites, which was final as of February 2003.

The CSM describes the site and its environmental setting. The CSM presents information regarding: 1) MEC and/or MC known or suspected to be at the site; 2) current and future reasonably anticipated or proposed uses of the real property; and 3) actual, potentially complete, or incomplete exposure pathways that link them.

The CSM is presented in a series of information profiles that provide information about the site. The information profiles are included in Table 5.11-1 below.

Table 5.11-1: Conceptual Site Model Information Profiles – Lower Lake		
Profile Type	Information Needs	Preliminary Assessment Findings
Range/Site Profile	Installation Name	NAVWPNSTA Seal Beach Detachment Fallbrook
	Installation Location	Detachment Fallbrook is located 53 miles north of San Diego in northern San Diego County, CA.
	Range/Site Name	Lower Lake
	Range/Site Location	Lower Lake is in the southwestern portion of the installation.
	Range/Site History	Lower Lake is an artificial lake created prior to development of the installation. A 1958 memorandum from the officer in charge to the commanding officer states that certain munitions were dumped into the lake during WWII. It states that other types of munitions may have been dumped, and that munitions had been recovered from the lake in the past during dry summer seasons.
	Range/Site Area and Layout	Lower Lake is approximately 3 acres. The lake is fed by streams from the north, east, and west and held by an earthen dam at the western end.
	Range/Site Structures	There are no structures currently on Lower Lake.

Table 5.11-1: Conceptual Site Model Information Profiles – Lower Lake		
Profile Type	Information Needs	Preliminary Assessment Findings
	Range/Site Boundaries	Map 2.1-1 shows the location of Lower Lake. N: Coastal sage scrub extends north of the lake. S: Mixed grassland and coastal sage scrub habitat are located south of the lake. W: The boundary of the installation is within approximately 1,000 feet west of the lake. E: Mixed grassland and coastal sage scrub habitat are located east of the lake. Magazines are located within approximately 1,500 feet east of the lake.
	Range/Site Security	Detachment Fallbrook is a fenced and guarded installation. Security Forces personnel are responsible for maintaining law and order, and for implementing access control policies and procedures. Once inside the installation, Lower Lake is located inside a controlled area.
Munitions/ Release Profile	Munitions Types	Historical records indicate that 20-mm, 40-mm, and 60-mm cartridges, 7.2-inch projector charges, and potentially other munitions were dumped into the lake during WWII.
	Maximum Probability Penetration Depth	Penetration from firing is not a factor at Lower Lake. MEC at Lower Lake could be below the water surface, buried in sediment, or partially buried, depending on sediment loading.
	MEC Density	Lower Lake is a suspected MEC area. The site is suspected to have a medium MEC density; however, some areas of the lake may have a higher or lower density depending on disposal practices.
	MEC Scrap/Fragments	The presence of MEC scrap or fragments is unknown.

Table 5.11-1: Conceptual Site Model Information Profiles – Lower Lake		
Profile Type	Information Needs	Preliminary Assessment Findings
	Associated Munitions Constituents	<p>The primary MC of concern are:</p> <ul style="list-style-type: none">○ 20-mm, 40-mm, and 60-mm cartridges: PBX, zirconium pellets, RDX, black powder, HMX, beryllium, cobalt, copper, lead, manganese, lead azide, lead styphnate, phosphorus, antimony sulfide, zinc, zinc stearate, aluminum, cadmium, chromium, copper salt, cumene hydroperoxide, methyl chloroform, sodium nitrate, toluene, triethylamine, xylenes, zinc phosphate, lead chromate (VI), 2-ethoxyethylacetate, and lead naphthenate; and○ 7.2-inch projector charges: TNT, RDX, lead, and aluminum.
	Migration Routes/Release Mechanisms	<p>Migration of MEC and MC may occur through sediment transport and deposition. Future construction, excavation, and maintenance at the site are also potential release mechanisms. MC could leach from the munitions into the lake. Potentially contaminated lake water could also migrate during its use for fire suppression. Lake water contaminated with MC might infiltrate into the groundwater.</p>
Physical Profile	Climate	<p>The climate at Detachment Fallbrook is typical of the prevailing southern California Mediterranean climate and is characterized by mild winters, cool summers, and infrequent rainfall. The annual average temperature is 63 °F. Precipitation ranges from 13.7 to 17.1 inches per year, with January being the wettest month and July the driest. Summers at the installation are punctuated by the Santa Ana (offshore) winds.</p>
	Topography & Bathymetry	<p>The area surrounding Lower Lake contains low hills. Specific bathymetry for Lower Lake is unknown.</p>
	Geology	<p>The region is underlain by plutonic and metasedimentary rocks of the Peninsular Ranges geomorphic province, but site-specific information was not available.</p>
	Soil	<p>The soil surrounding Lower Lake and the sediment in the lake are classified as coarse sandy loam of granitic origin.</p>

Table 5.11-1: Conceptual Site Model Information Profiles – Lower Lake		
Profile Type	Information Needs	Preliminary Assessment Findings
	Hydrogeology	No site-specific groundwater depth data were available
	Hydrology	Lower Lake is within the watershed of the Santa Margarita River. The lake is approximately 8 to 16 feet deep during the summer months and 12 to 25 feet during the winter months
	Vegetation	The vegetation in the area of Lower Lake is considered to be riparian in the shoreline surrounded by mixed grassland to the south and east and coastal sage scrub to the north and west. Common species in mixed grassland habitat include native, perennial bunch grasses such as <i>Nassella</i> spp. mixed with nonnative annuals. Common species in coastal sage scrub habitat include coastal sagebrush, flat-topped buckwheat, laurel sumac, sage, goldenbush, and native grasses. Species common in riparian habitat include mulefat, arroyo willow, and elderberry.
Land Use and Exposure Profile	Current Land Use	Lower Lake is used to store water on the installation for fish and wildlife enhancement, and for wildfire protection. Lower Lake has been used for recreational fishing by boat and wading. As of 2004, all recreational activities on the lake have been suspended until further investigation under IRP and MRP.
	Current Human Receptors	Navy personnel and Navy-permitted visitors (including contractors).
	Current Activities (frequency, nature of activity)	Supplying water for wildfire suppression.
	Potential Future Land Use	There is no planned change in the use of the site.
	Potential Future Human Receptors	Navy personnel and Navy-permitted visitors (including contractors)
	Potential Future Land Use-Related Activities:	Any potential future use activities would have to follow any Navy ESQD Arc waivers or exemptions. Other potential future activities at the site include environmental and ecological surveys
	Zoning/Land Use Restrictions	Due to the proximity of the site to some of the installation's munitions storage bunkers, ESQD Arc restrictions apply to Lower Lake.

Table 5.11-1: Conceptual Site Model Information Profiles – Lower Lake		
Profile Type	Information Needs	Preliminary Assessment Findings
	Demographics/Zoning	<p>The Detachment Fallbrook has a workforce of Command personnel comprised of 63 military, 65 civilian, and 12 contractors, as well as Tenant personnel comprised of 9 military, 126 civilian, and 90 contractors. Demographic data include the following:</p> <ul style="list-style-type: none">• Town of Fallbrook: Population (U.S. Census, 2000): 29,100• San Diego County: Population (U.S. Census, 2000): 2,813,833
	Beneficial Resources	Least Bell's vireo habitat and water storage.
Ecological Profile	Habitat Type	Lower Lake is a riparian habitat and is surrounded by mixed grasslands and coastal sage scrub habitat.
	Degree of Disturbance	Disturbance at Lower Lake is expected to be low. The lake supplies water for wildfire suppression. Disturbance below the water level is expected to be minimal.
	Ecological Receptors	
	General	Common flora/fauna includes mammals (kangaroo rats, voles, deer, mice, ground squirrels, opossum, rabbits, and coyotes), amphibians (tree frogs and bullfrogs), reptiles (orange-throated whiptails, rattlesnakes, and horned lizards), and birds (burrowing owls, kites, sparrows, kingbirds, and hawks). Fish species occurring in the lake include catfish, sunfish, and bass.
	Federal Endangered Species:	Arroyo toad, Least Bell's vireo, Southwestern willow flycatcher, and Stephen's kangaroo rat.
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	Potential human receptors at the Lower Lake include Navy personnel, visitors, and private contractors. Ecological receptors may come into direct contact with MEC and/or MC in the water. Receptors may also come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and prey). There is also a potentially complete exposure pathway for the general public coming into contact with MC migrating off the installation through the surface water system.

A key element of the CSM is the exposure pathway analysis, which is performed separately for MEC and for MC

For MEC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MEC are expected to be found); 2) access (e.g., controlled or uncontrolled access, items on the surface or within the subsurface); 3) an activity (e.g., non-intrusive grounds maintenance or intrusive construction); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, authorized visitors, or ecological receptors). It is important to recognize that environmental mechanisms (e.g., erosion) and/or human intervention may result in the repositioning of MEC.

For MC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MC are expected to be found); 2) an exposure medium (e.g., surface soil); 3) an exposure route (e.g., dermal contact); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, authorized visitors, or ecological receptors). If the point of exposure is not at the same location as the source, the pathway may also include a release mechanism (e.g., volatilization) and a transport medium (e.g., air).

The potential interactions between the source and receptors are assessed differently between MEC and MC. For MC, interaction between the source and receptors involves a release mechanism for the MC, an exposure medium that contains the MC, and an exposure route that places the receptor into contact with the contaminated medium. For MEC, interaction between the potential receptors and an MEC source has two components. The receptor must have access to the source and must engage in some activity that results in contact with individual MEC items within the source area.

MEC Interactions and Pathway Analysis

The exposure pathway analysis for MEC is shown in Figure 5.11-2 because historical evidence indicates that MEC were disposed at Lower Lake. No MEC was observed during visual inspection. The release mechanism of handling/treading underfoot activities is a potentially complete exposure pathway for both human receptors and biota. Biota on the site may disturb the sediment through nesting on the lake's banks or feeding. The release mechanism of intrusive activities (such as digging or drilling) is a potentially complete exposure pathway for both human

and ecological receptors. Navy personnel and contractors may be exposed during site investigations or from potential future land use changes that may require construction

MC Interactions and Pathway Analysis

The exposure pathway analysis for MC is shown in Figure 5.11-3. Potential receptors include both human (Navy personnel, contractor/visitor, and trespasser) and ecological receptors (biota) that may come in contact with MC in the source medium or other potentially contaminated media. Pathways are shown for each medium and are discussed below. For MC, interaction between the source (i.e., disposed munitions) and receptors generally involves a release mechanism for the MC (e.g., runoff into the surface water or uptake into the food chain), an exposure medium containing the MC (e.g., sediment or surface water), and an exposure route (e.g., incidental ingestion or dermal contact) that places the receptor into contact with the contaminated medium.

Surface Water/Sediment

The most direct release mechanism for MC from Lower Lake is surface water or sediment. Because the lake is not used for drinking water, the exposure pathway for surface water and/or sediment is considered potentially complete for human receptors through dermal contact and ingestion and for biota living in or near the lake. Navy personnel and contractors may be exposed during site investigations or from potential future land use changes that may require construction. Biota on the site may disturb the sediment through nesting on the lake's banks or feeding. Water removed during wildfire suppression actions could potentially transfer MC in the surface water from the lake onto the wildfire area. As mentioned in Section 3.7, MCB Camp Pendleton uses surface water from the Santa Margarita River Watershed for municipal and domestic purposes. This could potentially affect both civilians and military personnel at MCB Camp Pendleton. The general public could also come into contact with MC migrating off the installation through the surface water system.

Plant/Animal Uptake

Potentially complete pathways are indicated for biota (such as rattlesnakes) exposed to MC at Lower Lake via the food chain. MC may be taken up by plants and prey and consumed by animals (wildlife) at the lake.

Groundwater

Potentially complete pathways for Navy personnel and contractors/visitors are indicated for groundwater contaminated with MC at and near Lower Lake. Navy personnel and contractors/visitors may come into contact with groundwater during environmental investigations (i.e. monitoring well installation and sampling) at and near the lake. As mentioned in Section 3.7, MCB Camp Pendleton extracts and uses groundwater from the Santa Margarita Watershed; this could potentially affect both civilians and military personnel at MCB Camp Pendleton. The potential for groundwater impacts is considered to be incomplete for all other receptors.

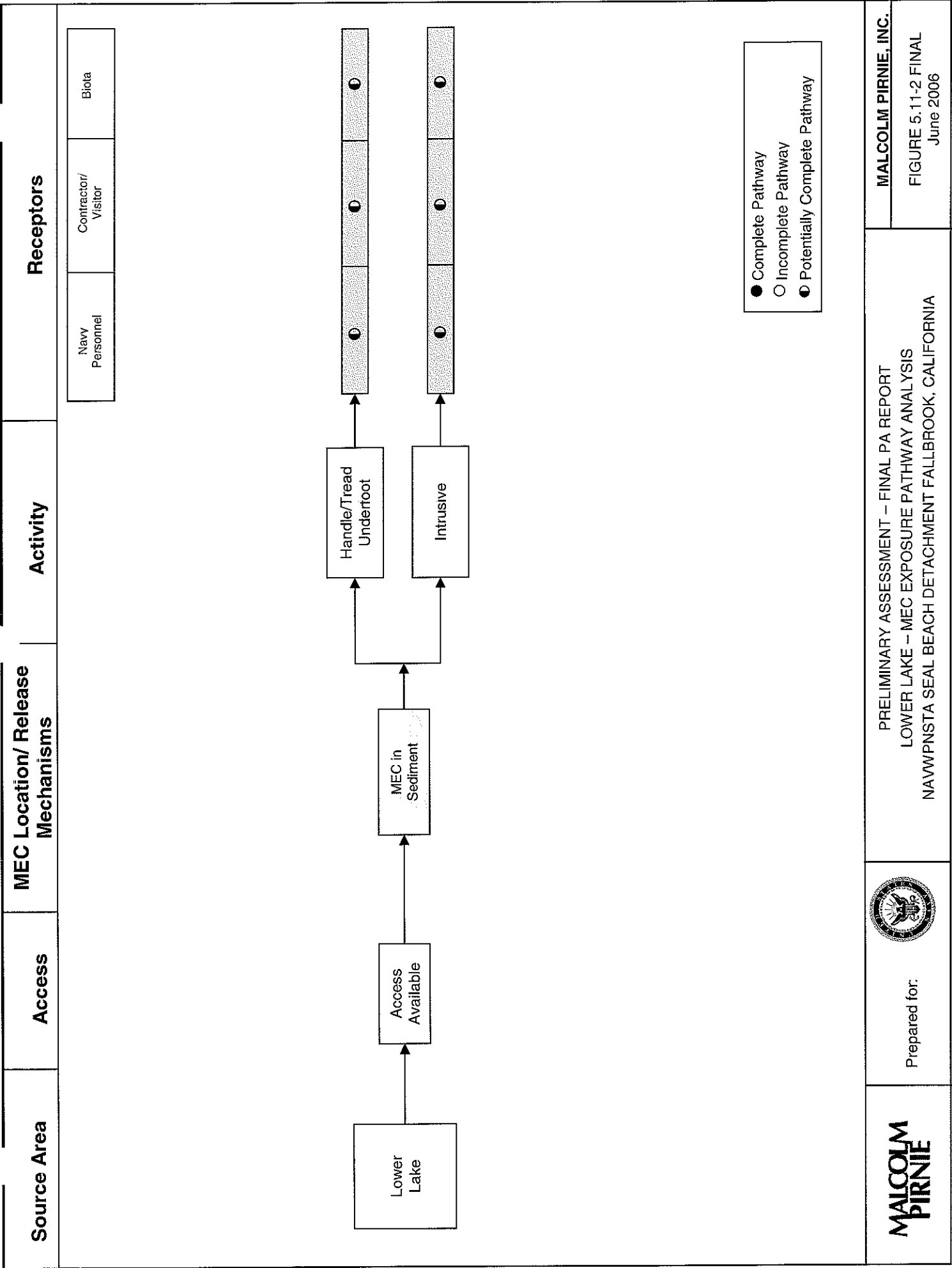
An exposure pathway does not exist for MC in the air, surface soil, and subsurface soil for human or ecological receptors.

5.11.12. Summary

Lower Lake is a 3-acre artificial lake which historical records indicate had munitions (20-mm, 40-mm, and 60-mm cartridges and 7.2-inch projector charges) dumped into during WWII. Records also show that other types of munitions may have been dumped as well, and that, during past dry summer seasons, munitions have been recovered from the lake. Lower Lake is used to store water on the installation for fish and wildlife enhancement, and for wildfire protection. Potential receptors include Navy personnel, Navy-permitted visitors, and ecological receptors. Though no munitions or munitions scrap were observed during the site visit in March 2005, the lake is suspected to contain MEC and MC.

5.11.13. Recommendations

Based on the data collected and presented in this PA, an SI is recommended for both MEC and MC at Lower Lake.




Preliminary Assessment
NAWPNSTA Seal Beach
Detachment Fallbrook, California



MALCOLM
PIRNIE

Map 5.11-1
Visual Survey
Lower Lake

Legend

 Site Reconnaissance Path

 Lower Lake

0 30 Meters

Data Source: Anteon Corporation,
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006



Preliminary Assessment
NAVWPNSTA Seal Beach
Detachment Fallbrook, California

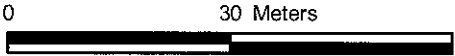


MALCOLM
PIRNIE

Map 5.11-2
Site Details
Lower Lake

Legend

- Lower Lake
- Topographic Contours
(feet above MSL)

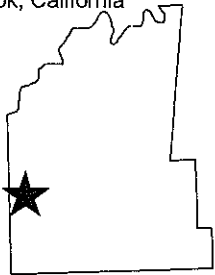


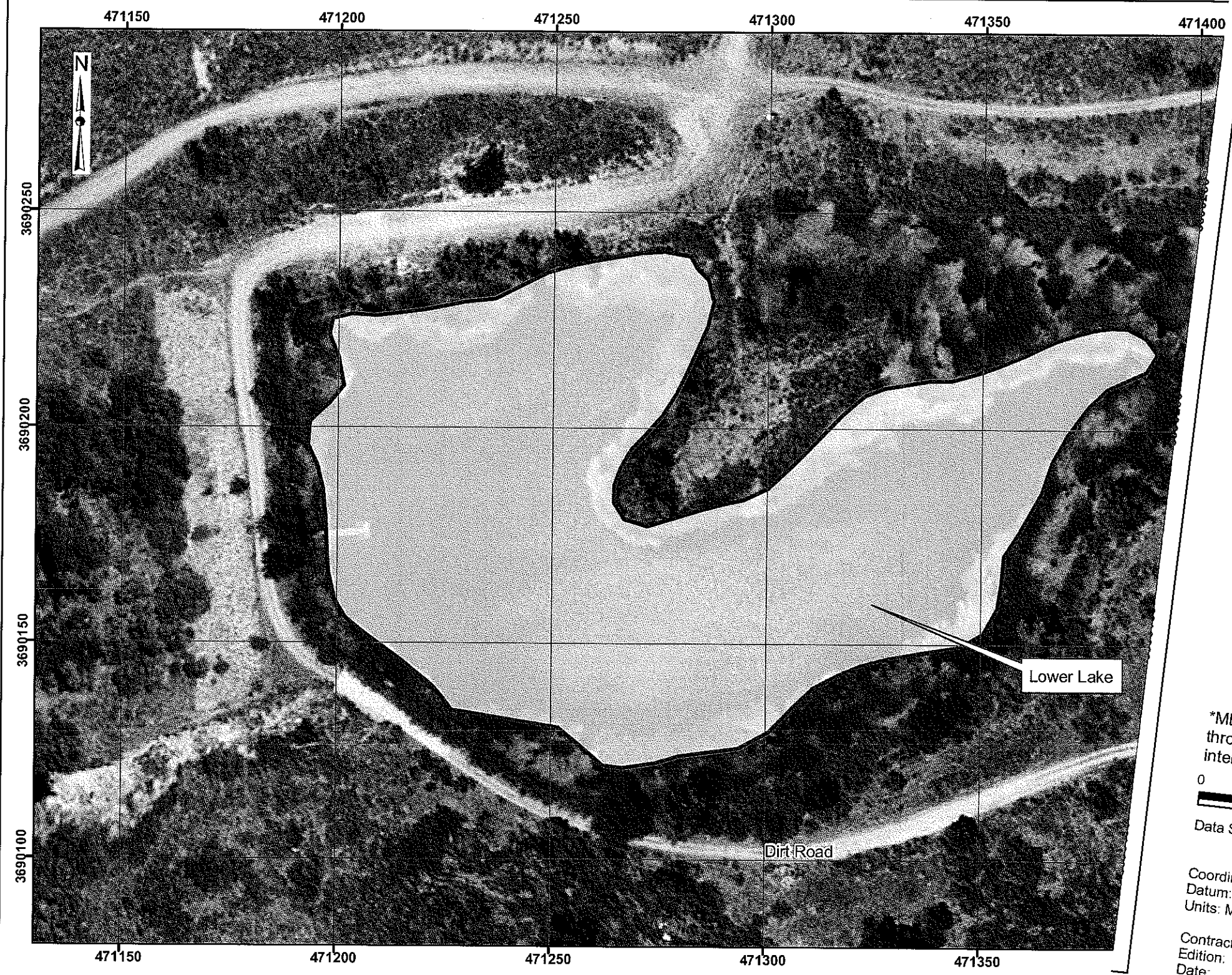
Data Source: Anteon Corporation,
Ortho Photo, June 3, 2004
NAVWPNSTA Seal Beach GIS Data,
Vector Contour Data

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006

NAVWPNSTA Seal Beach
Detachment Fallbrook, California
Lower Lake





Preliminary Assessment
NAVWPNSTA Seal Beach
Detachment Fallbrook, California



MALCOLM
PIRNIE

Map 5.11-3
Munitions Characterization
Lower Lake

Legend

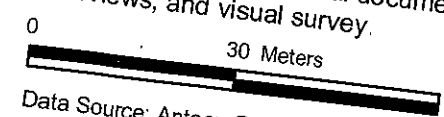
Lower Lake

MEC Presence*

Known

Suspect

*MEC Presence was determined
through review of historical documentation,
interviews, and visual survey.



Data Source: Anteon Corporation,
Orthophoto, June 3, 2004

Coordinate System: UTM Zone 11N
Datum: NAD 83
Units: Meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: June 2006

Appendix A: References

FINAL PRELIMINARY ASSESSMENT

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Reports

- 1) *Addendum to the Preliminary Assessment for Naval Weapons Station Seal Beach*. Prepared by: Jill Reichle and Jed Costanza August 1990
- 2) *Cultural Resources Inventory and Survey Report for the Naval Weapons Station Seal Beach Detachment Fallbrook, CA*. Prepared by: Mooney & Associates May 2000.
- 3) *History of the Bureau of Yards and Docks and the Civil Engineering Corps from 1940-1946, Volume I*. Prepared by: the U.S. Government Printing Office. 1947
- 4) *Integrated Natural Resources Management Plan for Naval Ordnance Center-Pacific Division Fallbrook Detachment*. December 1996.
- 5) *Land Use Compatibility Study for Naval Weapon Station Seal Beach. an Encroachment Study*. September 1985.
- 6) Marine Corps Base (MCB) EOD Support/Ammo Expenditure Sheet from Jim Oliver February 15, 2002.
- 7) MCB EOD Support/Ammo Expenditure Sheet from Jim Oliver. February 15, 2003
- 8) MCB EOD Support/Ammo Expenditure Sheet from Jim Oliver. November 9, 2004
- 9) *Wartime History of NAD Fallbrook from the Bureau of Ordnance's Selected Ammunition Depots Volume I*. Prepared by: the Bureau of Ordnance Historical Section. January 1946

Memorandums and Letters

February 1942 to the Secretary of the Navy from the Acting Inspector of Ordnance about the commissioning of NAD Fallbrook, CA.

September 1945 Bureau of Ordnance Circular Letter X19-45 about the disposition of obsolete and/or Bureau surplus inert ordnance property.

October 1946 to the Area Wage and Classification Office about the mission of NAD Fallbrook

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April 1947 to the Chief of the Bureau of Ordnance from the Commanding Officer at U.S. NAD Fallbrook about the disposition of sulfur trioxide (FS) smoke mixture.

September 1949 to the Commanding Officer at U.S. NAD Fallbrook from the Chief of the Bureau of Ordnance about the disposition of ammonium nitrate cratering charges.

July 1952 to the Commanding Officer at U.S. NAD Fallbrook Letter from the Chief of the Bureau of Ordnance about the approval of ammunition disposal area

May 1960 to the Officer in Charge from the Security Officer about a report of the apprehension of an Annex trespasser

January 1968 to the Chief of Naval Operations from the Commanding Officer at U.S. NWS Seal Beach about the submission of the command history for U.S. NWS Seal Beach for 1967.

February 1969 to the Officer in Charge from Lewis Reed (the President of the Fallbrook Junior Rifle Club).

April 1969 to the Commanding Officer, Marine Barracks, from Officer in Charge about use of the target range by civilian groups.

November 1975 to the Commander, Naval Sea Systems Command (NSSC), from the Commanding Officer NWS, Seal Beach, CA about Navy Explosive Safety Waivers and Exemptions.

March 1976 First endorsement on Code 30 Memo (24 February 1976) about the request for an Explosives Test Site approval

April 1977 about the re-evaluation of additional keyport magazines (includes maps)

November 1979 about the proposed firing range magazine and building distances (includes maps).

January 1985 from P.G. Bulkley on the Closing of the Fallbrook Marine Barracks

December 1985 to the Commanding Officer at NWS Seal Beach from the Commander of Naval Sea Systems Command about the request for a burn site approval.

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Guidance Documents

USEPA's Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final (1988, EPA/540/G-89/004)

Final USACE CSM Guidance Development of Integrated Conceptual Site Models for Environmental OE Sites (2003).

Websites

<http://www.navyrangeinventory.net> (Fallbrook SF Small Arms Range information), September 2004.

http://www.sbeach.navy.mil/Info/station_det/Fallbrook.htm (General information regarding Detachment Fallbrook), September 2004.

<http://www.globalsecurity.org/military/facility/fallbrook.htm> (General information regarding Detachment Fallbrook), September 2004.

http://www.consrv.ca.gov/cgs/information/publications/cgs_notes/note_36/note_36.pdf (Geologic information for San Diego County), November 2004.

<http://fallbrook.areacconnect.com/statistics.htm> (Fallbrook population information), November 2004

<http://www.census.gov/popest/counties/CO-EST2003-01.html> (General information on San Diego County), November 2004

<http://www.sdnhm.org/research/paleontology/sdgeol.html> (General information on San Diego County Geology), January 2005

http://www.dfg.ca.gov/whdab/html/quick_viewer_launch.html (California Wildlife and Habitat Data Analysis Branch), July 2005

Maps and Aerial Photos

General Development Map for U.S. Naval Weapons Station Seal Beach, Fallbrook Detachment, October 1965.

FINAL PRELIMINARY ASSESSMENT

Map of U.S. Naval Weapons Station Fallbrook, Undated.

General Development Map for U.S. Naval Weapons Station Seal Beach, Fallbrook Detachment, June 1951

Map of U.S. Naval Weapons Station Fallbrook, Undated

Photo showing one of the three burn/slit trenches in use at the Fallbrook QE Test Area, June 1968.

Photo showing inside view of one of the three burn/slit trenches at the Fallbrook QE Test Area, June 1968

Master Shore Station Development Plan Map for U.S. Naval Weapons Station Seal Beach, Fallbrook Detachment, February 1954.

Master Shore Station Development Plan Map for U.S. Naval Weapons Station Seal Beach, Fallbrook Detachment, June 1953

Map of Naval Ammunition Depot, Fallbrook, California, Eleventh Naval District, San Diego, California, Showing Conditions on June 30, 1942.

Appendix B: Project Source Data – General

Naval Weapons Station Seal Beach, Detachment Fallbrook Preliminary Assessment Reference Direc				FINAL - June 2006
Listing of NAVWPNSTA Seal Beach, Detachment Fallbrook Final Preliminary Assessment references and associated electronic files.				
Site	Document Type	Reference Description	Location	Reference Filename
General	Report	Addendum to the Preliminary Assessment for Naval Weapons Station Seal Beach. Prepared by: Jill Reichle and Jed Costanza. August 1990.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Reports	1990 Preliminary Assessment for NWS Seal Beach
General	Report	Cultural Resources Inventory and Survey Report for the Naval Weapons Station Seal Beach Detachment Fallbrook, CA. Prepared by: Mooney & Associates. May 2000.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Reports	2000 Fallbrook Cultural Resources Inventory and Survey
General	Report	History of the Bureau of Yards and Docks and the Civil Engineering Corps from 1940-1946, Volume 1. Prepared by: the U.S. Government Printing Office. 1947.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Reports	1947 History of the Bureau of Yards and Docks
General	Report	Integrated Natural Resources Management Plan for Naval Ordnance Center-Pacific Division Fallbrook Detachment. December 1996.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Reports	1996 Fallbrook INRMP
		Integrated Natural Resources Management Plan for MCB & MCAS Camp Pendleton. October 2001.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Reports	2001 INRMP MCB & MCAS Camp Pendleton
General	Report	Land Use Compatibility Study for Naval Weapon Station Seal Beach: an Encroachment Study. September 1985.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Reports	1985 Land Use Compatability Study
General	Report	Marine Corps Base (MCB) EOD Support/Ammo Expenditure Sheet from Jim Oliver. February 15, 2002.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Reports	2002 MCB EOD Support Ammo Expenditure Sheet (February)
General	Report	MCB EOD Support/Ammo Expenditure Sheet from Jim Oliver. February 15, 2003.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Reports	2003 MCB EOD Support Ammo Expenditure Sheet (February)
General	Report	MCB EOD Support/Ammo Expenditure Sheet from Jim Oliver. November 9, 2004.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Reports	2004 MCB EOD Support Ammo Expenditure Sheet (November)
General	Report	Wartime History of NAD Fallbrook from the Bureau of Ordnance's Selected Ammunition Depots Volume 1. Prepared by: the Bureau of Ordnance Historical Section. January 1946.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Reports	1946 Wartime History of NAD Fallbrook
General	Memos	February 1942 to the Secretary of the Navy from the Acting Inspector of Ordnance about the commissioning of NAD Fallbrook, CA.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	February 1942 Commissioning of Fallbrook
General	Memos	September 1945 Bureau of Ordnance Circular Letter X19-45 about the disposition of obsolete and/or Bureau surplus inert ordnance property.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	September 1945 Obsolete or Inert Ordnance Disposition
General	Memos	October 1946 to the Area Wage and Classification Office about the mission of NAD Fallbrook.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	October 1946 Mission of NAD Fallbrook
General	Memos	April 1947 to the Chief of the Bureau of Ordnance from the Commanding Officer at U.S. NAD Fallbrook about the disposition of sulfur trioxide (FS) smoke mixture.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	April 1947 Disposition of Sulfur Trioxide Smoke Mixture
General	Memos	September 1949 to the Commanding Officer at U.S. NAD Fallbrook from the Chief of the Bureau of Ordnance about the disposition of ammonium nitrate cratering charges.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	September 1949 Disposition of Ammonium Nitrate Cratering Charges
General	Memos	July 1952 to the Commanding Officer at U.S. NAD Fallbrook Letter from the Chief of the Bureau of Ordnance about the approval of ammunition disposal area.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	July 1952 Approval of Ammunition Disposal Area
General	Memos	October 1958 to the Commanding Officer from the Officer in Charge about a request for diving operations involving explosives at Fallbrook annex	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	October 1958 Diving Operations
General	Memos	May 1960 to the Officer in Charge from the Security Officer about a report of the apprehension of an Annex trespasser.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	May 1960 Annex Trespasser
General	Memos	January 1968 to the Chief of Naval Operations from the Commanding Officer at U.S. NWS Seal Beach about the submission of the command history for U.S. NWS Seal Beach for 1967.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	January 1968 Submission of Command History for US NWS Seal Beach
General	Memos	February 1969 to the Officer in Charge from Lewis Reed (the President of the Fallbrook Junior Rifle Club).	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	February 1969 Fallbrook Junior Rifle Club
General	Memos	April 1969 to the Commanding Officer, Marine Barracks, from Officer in Charge about use of the target range by civilian groups.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	April 1969 Civilian Use of Target Range
General	Memos	November 1975 to the Commander, Naval Sea Systems Command (NSSC), from the Commanding Officer NWS, Seal Beach, CA about Navy Explosive Safety Waivers and Exemptions.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	November 1975 Navy Explosive Safety Waivers and Exemptions
General	Memos	March 1976 First endorsement on Code 30 Memo (24 February 1976) about the request for an Explosives Test Site approval.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	March 1976 Explosive Test Site Approval
General	Memos	April 1977 about the re-evaluation of additional keyport magazines (includes maps).	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	April 1977 Reevaluation of Additional Keyport Magazines
General	Memos	March 1978 about a recap of weather related ordnance incidents at Fallbrook	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	March 1978 Weather Related Ordnance Incidents
General	Memos	November 1979 about the proposed firing range magazine and building distances (includes maps).	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	November 1979 Proposed Firing Range Magazine and Building Distances
General	Memos	January 1985 from P.G. Bulkeley on the Closing of the Fallbrook Marine Barracks.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	January 1985 Closing of Fallbrook Marine Barracks
General	Memos	December 1985 to the Commanding Officer at NWS Seal Beach from the Commander of Naval Sea Systems Command about the request for a burn site approval.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Memorandums and Letters	December 1985 Request for Burn Site Approval
General	Websites	http://www.navyrangeinventory.net (Fallbrook SF Small Arms Range information), September 2004.		
General	Websites	http://www.sbeach.navy.mil/Info/station_det/Fallbrook.htm (General information regarding NAVWPNSTA Seal Beach Detachment Fallbrook), September 2004.		
General	Websites	http://www.globalsecurity.org/military/facility/fallbrook.htm (General information regarding NAVWPNSTA Seal Beach Detachment Fallbrook), September 2004.		
General	Websites	http://www.consrv.ca.gov/cgs/information/publications/cgs_notes/note_36/note_36.pdf (Geologic information for San Diego County), November 2004.		
General	Websites	http://fallbrook.areaconnect.com/statistics.htm (Fallbrook population information), November 2004.		
General	Websites	http://www.census.gov/popest/counties/CO-EST2003-01.html (General information on San Diego County), November 2004.		
General	Websites	http://www.sdnhm.org/research/paleontology/sdgeol.html (General information on San Diego County Geology), January 2005.		
General	Map	General Development Map for U.S. Naval Weapons Station Seal Beach, Fallbrook Detachment, October 1965.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Maps and Aerial Photos	October 1965 Map
General	Map	Map of U.S. Naval Weapons Station Fallbrook, Undated.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Maps and Aerial Photos	Undated Map 1
General	Map	General Development Map for U.S. Naval Weapons Station Seal Beach, Fallbrook Detachment, June 1951.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Maps and Aerial Photos	June 1951 Map
General	Map	Map of U.S. Naval Weapons Station Fallbrook, Undated.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Maps and Aerial Photos	Undated Map 2
General	Aerial Photo	Photo showing one of the three burn/slit trenches in use at the Fallbrook QE Test Area, June 1968.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Maps and Aerial Photos	June 1968 Photo of Burn Trenches 1
General	Aerial Photo	Photo showing inside view of one of the three burn/slit trenches at the Fallbrook QE Test Area, June 1968	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Maps and Aerial Photos	June 1968 Photo of Burn Trenches 2
General	Map	Master Shore Station Development Plan Map for U.S. Naval Weapons Station Seal Beach, Fallbrook Detachment, February 1954.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Maps and Aerial Photos	February 1954 Map
General	Map	Map of Naval Ammunition Depot, Fallbrook, California, Eleventh Naval District, San Diego, California, Showing Conditions on June 30, 1942	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Maps and Aerial Photos	June 1942 Map
General	Map	Master Shore Station Development Plan Map for U.S. Naval Weapons Station Seal Beach, Fallbrook Detachment, June 1953.	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Maps and Aerial Photos	June 1953 Map
General	Aerial Photo	Photo showing East view of the U.S. Naval Ammunition Depot, Alt.: 10000 - Fallbrook, CA, January 16, 1959	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Maps and Aerial Photos	JAN 16 1959 US Naval Ammunition Depot-East
General	Aerial Photo	Photo showing aerial coverage of the US Marine Corps Ammunition Depot, Alt.: 12,000 Fallbrook, CA, May 27, 1949	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Maps and Aerial Photos	May 27 1949 US Marine Corps Ammunition Depot
General	Aerial Photo	Photo showing Fallbrook Ammunition Depot, ALT.: 10,000, April 28, 1948	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Maps and Aerial Photos	APR 28 1948 Fallbrook Ammo. Depot
General	Aerial Photo	Photo showing Aerial coverage of the Naval Ammunition Depot, Fallbrook, ALT.: 13,500 April 7, 1948	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Maps and Aerial Photos	APR 7 1948 N.A.D. Fallbrook-3
General	Aerial Photo	Photo showing Aerial coverage of the Naval Ammunition Depot, Fallbrook, ALT.: 13,500 April 7, 1948	NAVWPNSTA Seal Beach, Detachment Fallbrook Reference Directory/ Maps and Aerial Photos	APR 7 1948 N.A.D. Fallbrook-1

NAT. FALLBROOK, CALIF.

APR 7 1948

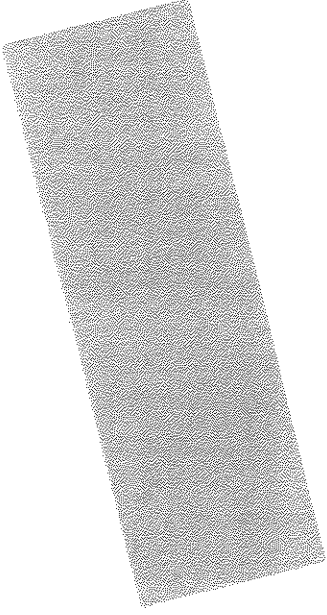
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ALT. 13,500 Ft.
CAMERA F-56

OFFICIAL PHOTOGRAPH

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Publication, by order
of the Chief of the
Bureau of Aerial Photography

1 - Aerial Coverage - Fallbrook, California

N.A.D. Fairgrook, Calif.



APR 1960

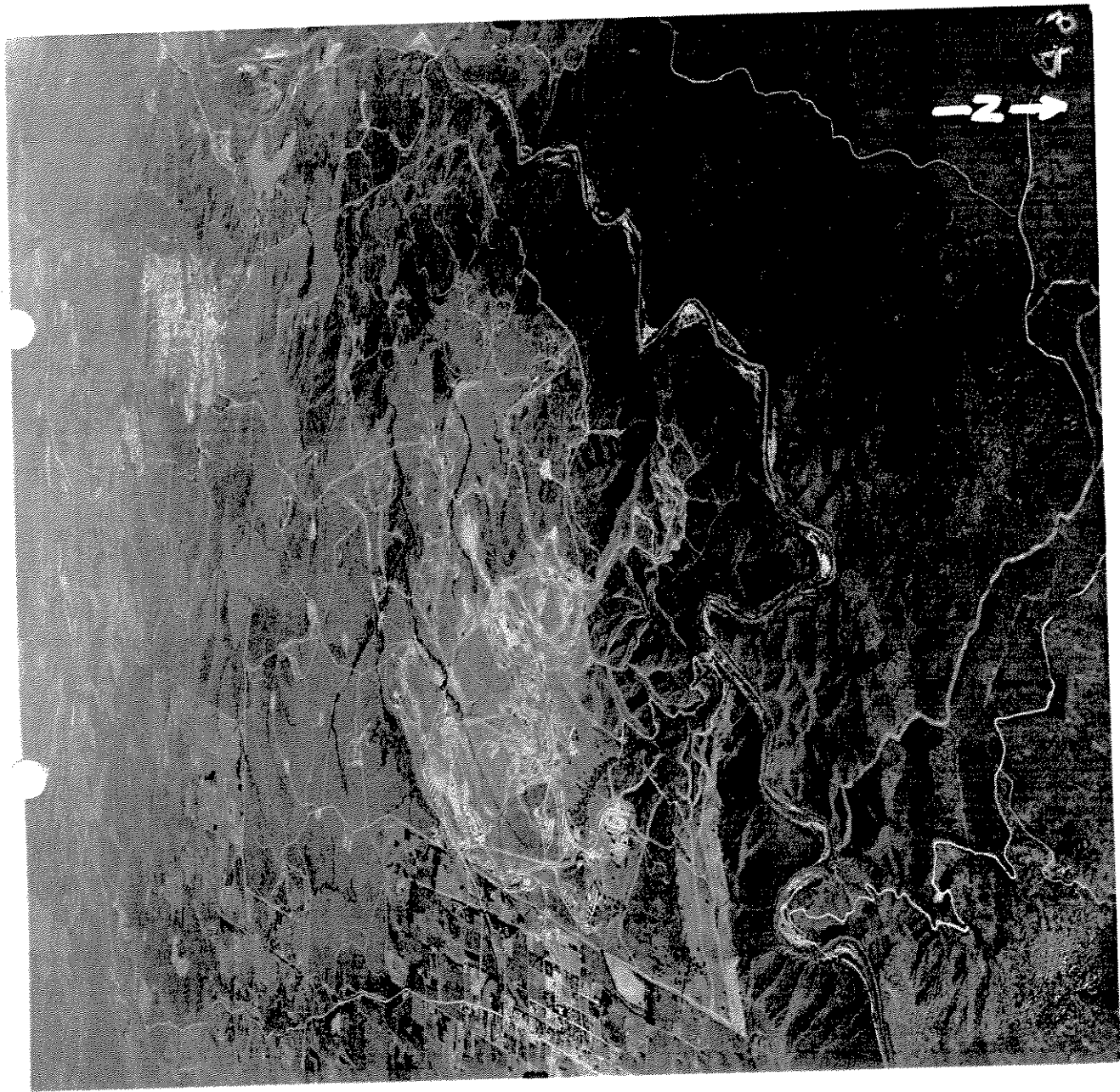
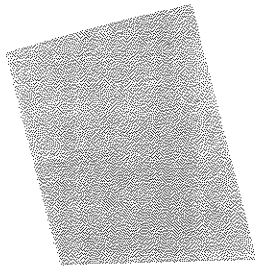
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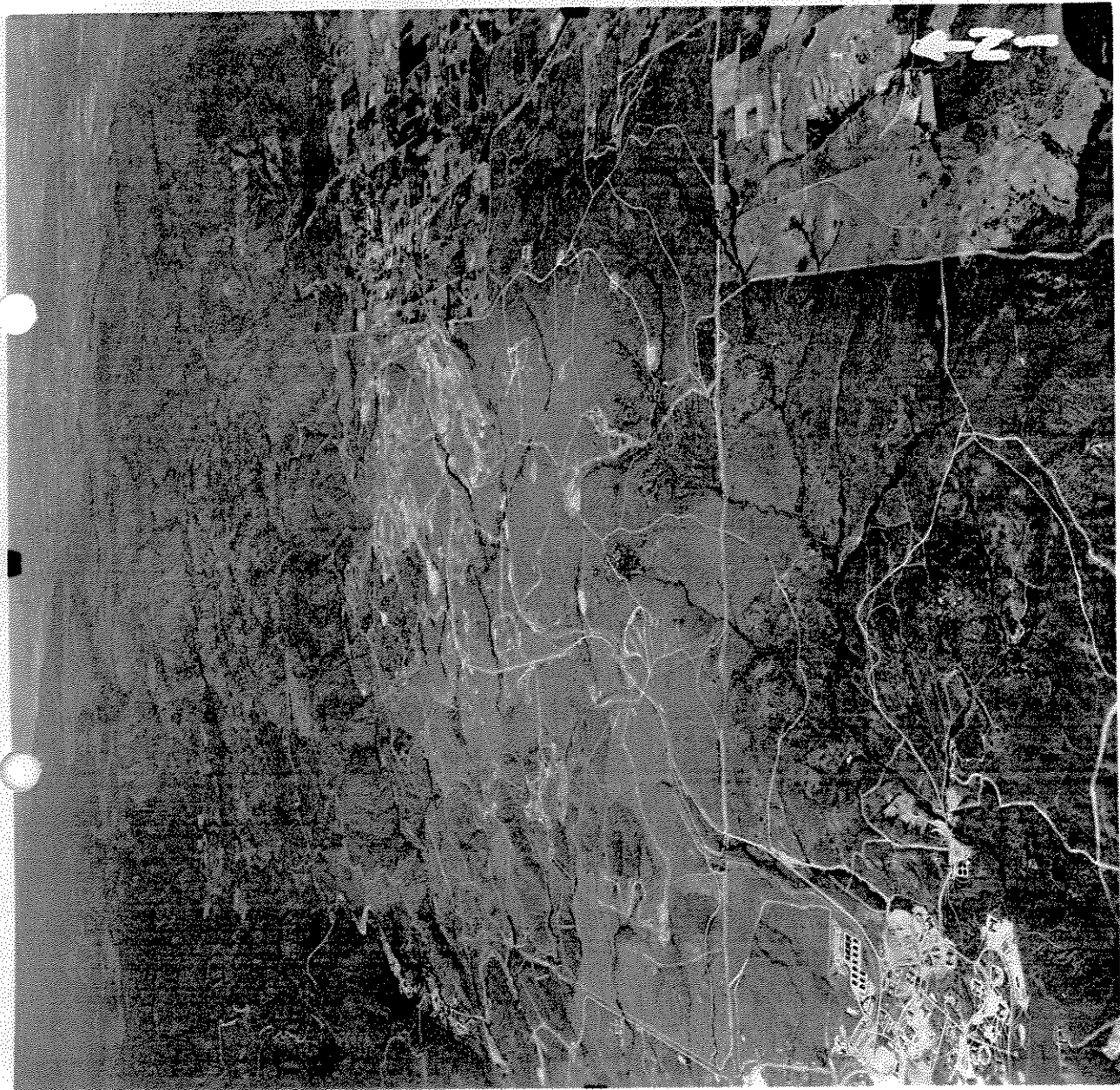
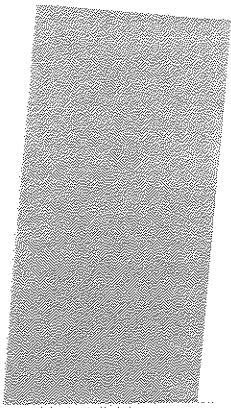


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of the

3 - Aerial Coverage - Fairgrook, California





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UNIT MARINE PHOTO SQDN-254
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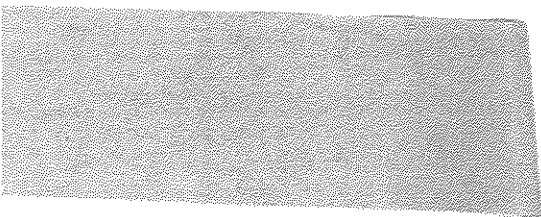
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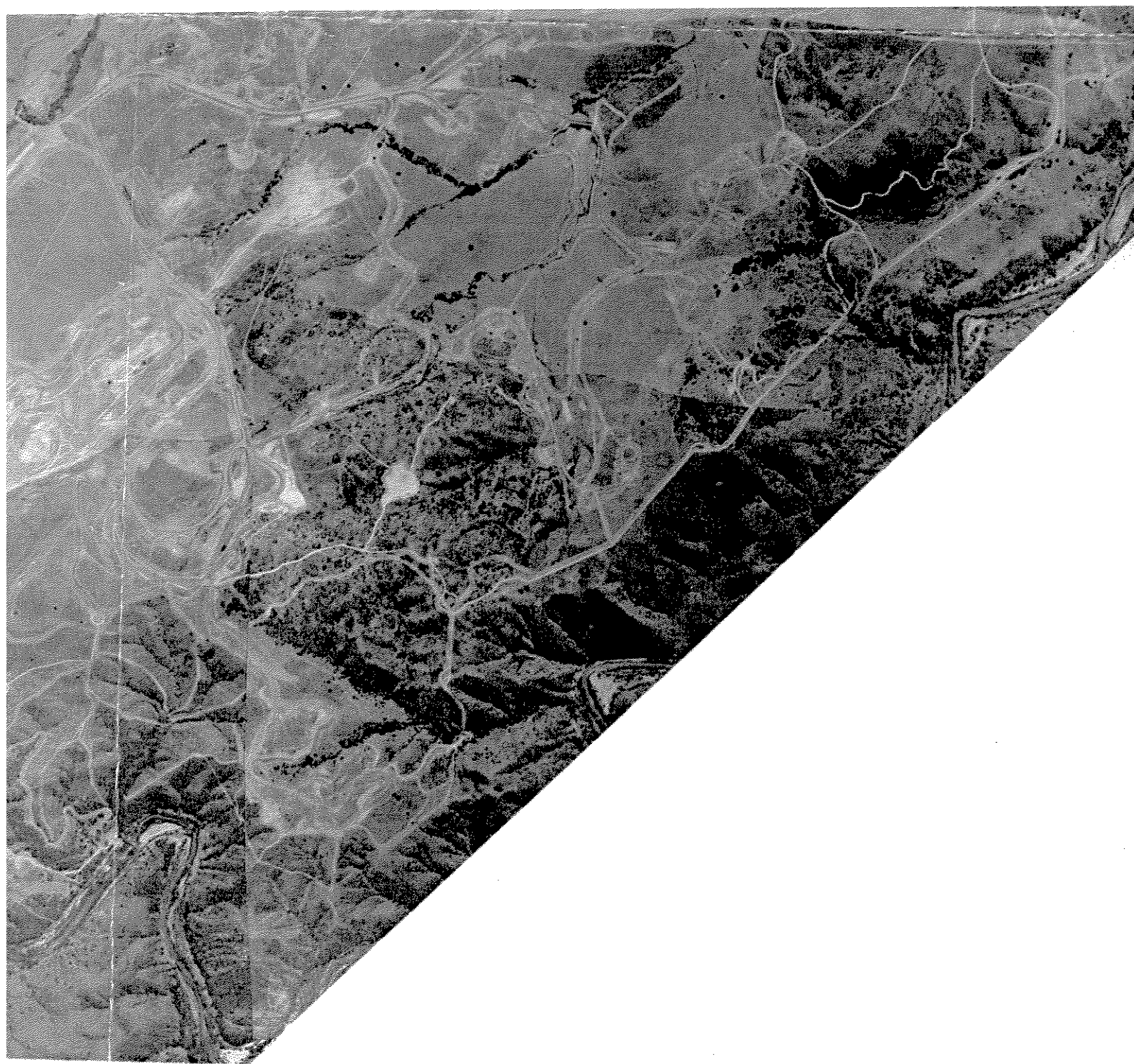
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OFFICIAL PHOTOGRAPH
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BY ORDER OF
THE CHIEF OF THE BUREAU
OF AERONAUTICS

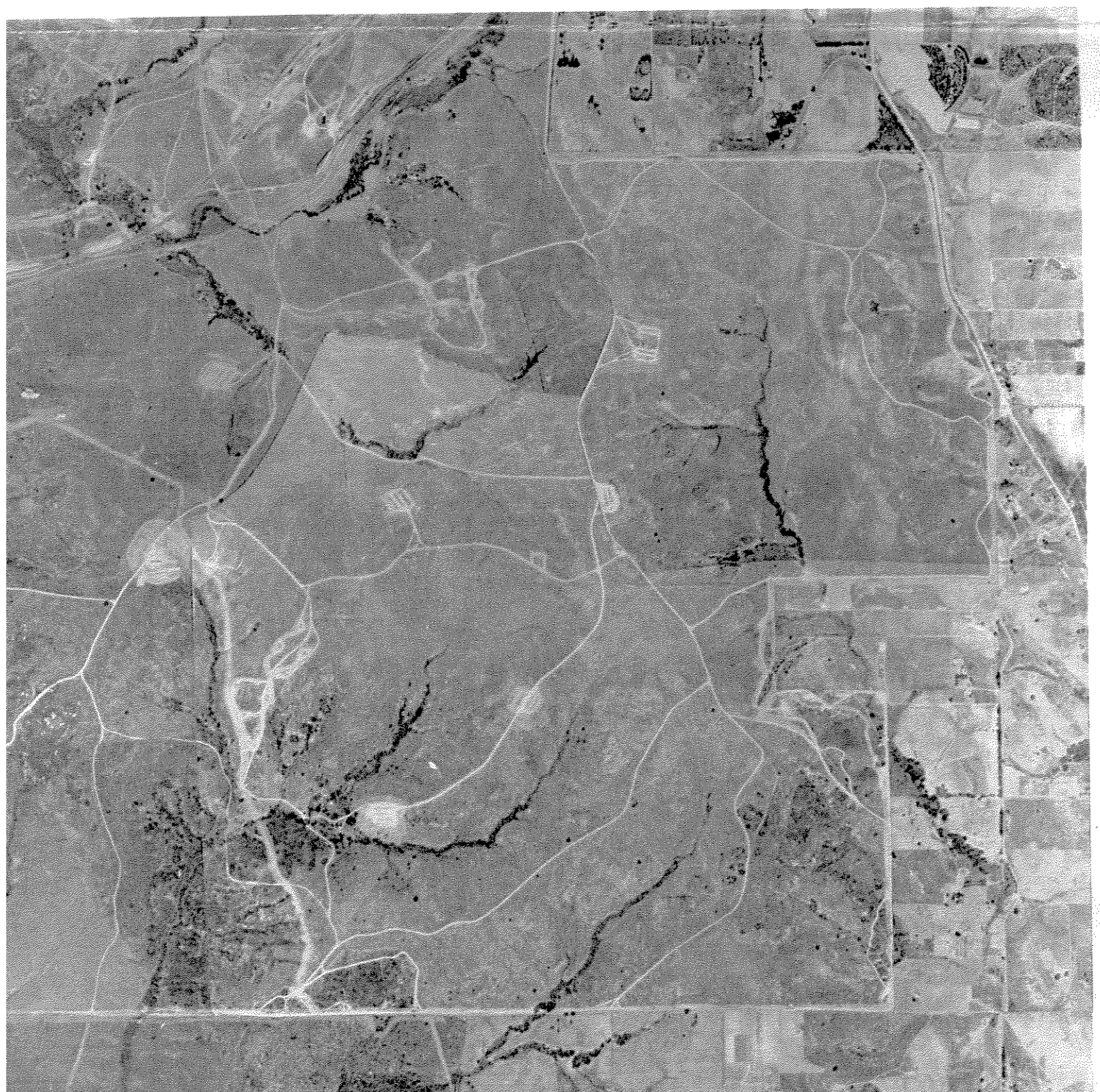


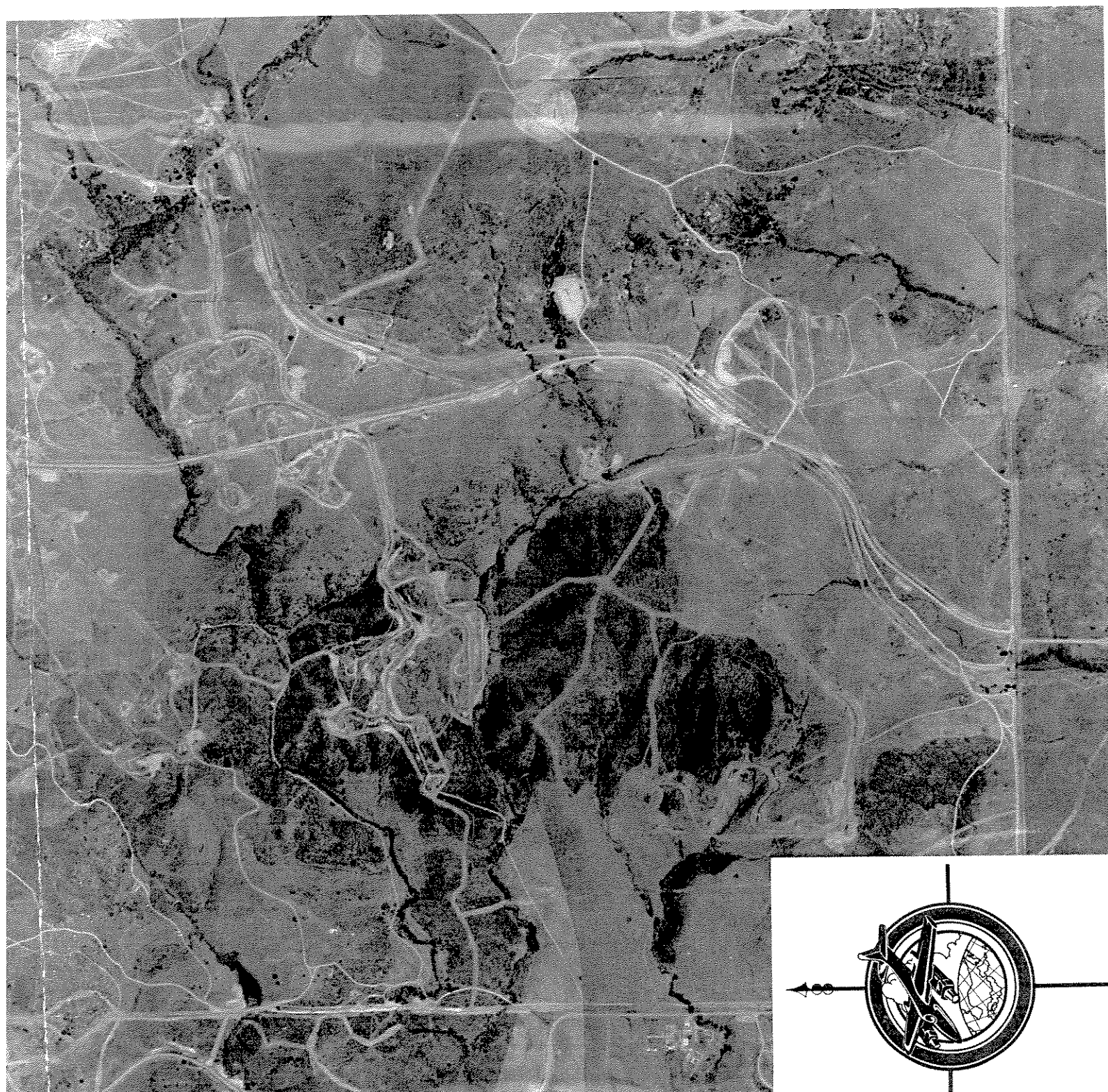
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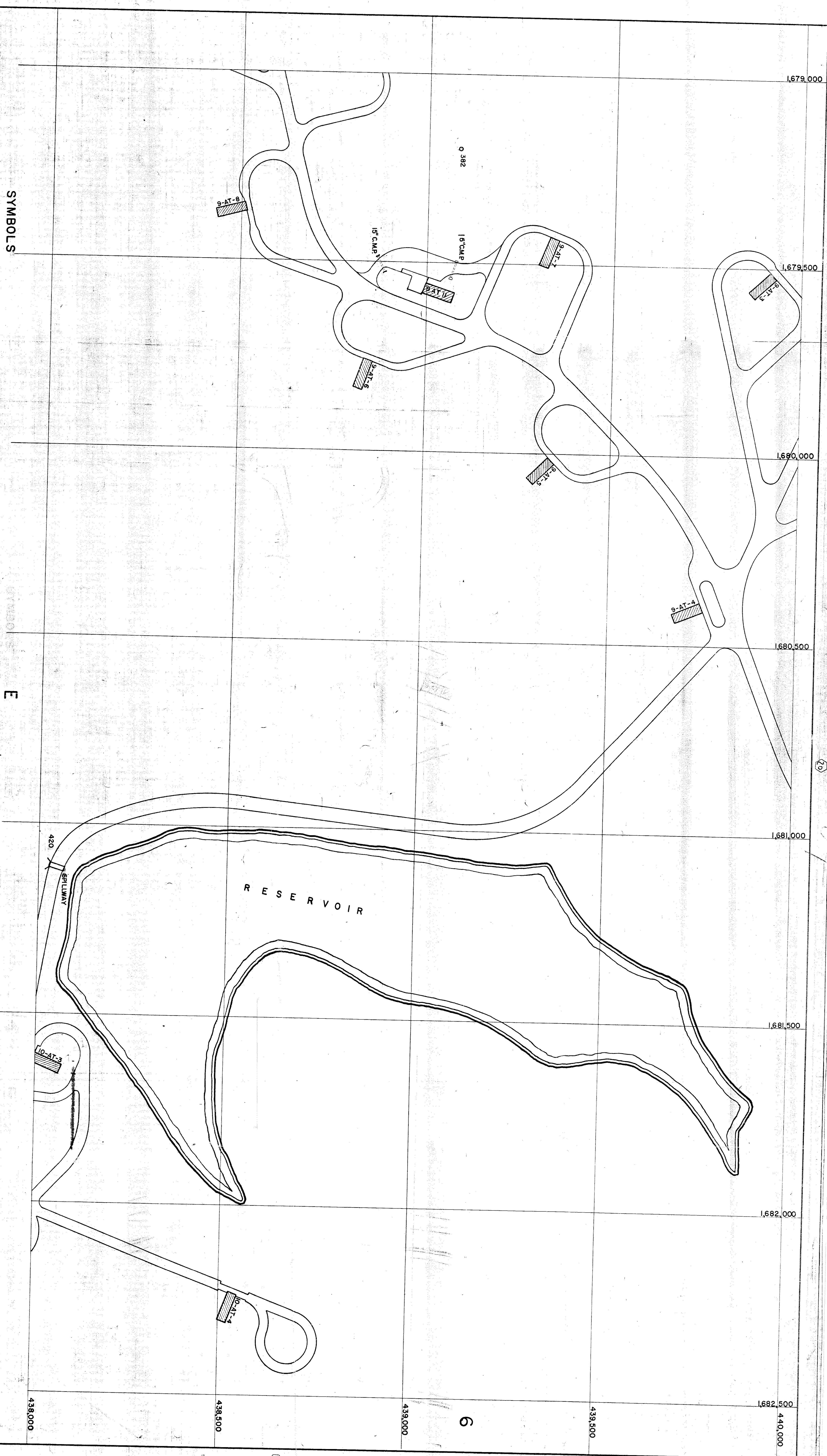












SYMBOLS

EXISTING W. TANK

LEGEND

- EXISTING BUILDING OR STRUCTURE
- EXISTING ROAD OR PAVED AREA
- EXISTING RAILROAD
- EXISTING FENCE



GRAPHIC SCALE IN FEET
0 50 100 200 300 400 500
1" = 100'

SYMBOL	DESCRIPTION	DATE	APPROVED
DEPARTMENT OF THE NAVY, BUREAU OF YARDS AND DOCKS AMMUNITION & NET DEPOT, SEAL BEACH, CALIFORNIA N. A. D. FALL BROOK, CALIFORNIA ANNEX			
MASTER SHORE STATION DEVELOPMENT PLAN PART IX SECTION 2 AREA DEVELOPMENT PLAN STRUCTURES			
DRAWN	CM		
TRACED	CFM		
CHECKED	EAL		
REVIEWED			
APPROVED	2/25/54	SUBMITTED 2-25-54	SCALE 1" = 100'
DATE	11.9.2000	DATE	SHEET 14 OF 40
COMMANDING OFFICER	11.9.2000	DATE	Y&D 640190
STATION DEVELOPMENT BOARD		DATE	DWG NO

SHEET 19 OF 191

FLEET AIR PHOTOLAB

UTROM SEVEN

BLDG 18

NAS, SAN DIEGO, CALIF.

VU-7-10738 Date JAN 16 1959

MADE FOR

SUBJECT

AERIAL OBLIQUE, LOOKING EAST,
U.S. NAVAL AMMUNITION DEPOT,
FALLBROOK, CALIF. alt: 10000

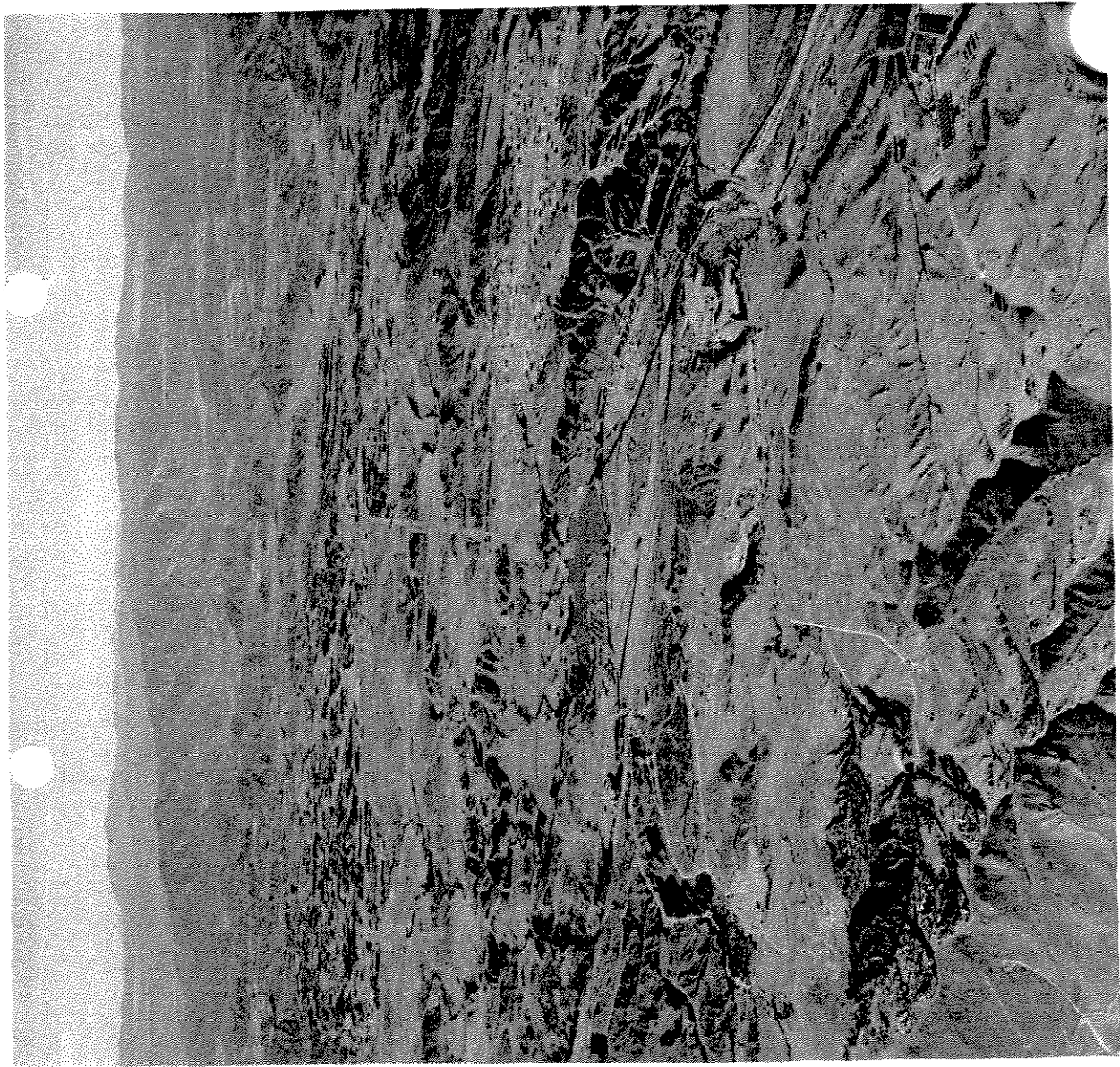
U.S. NAVY

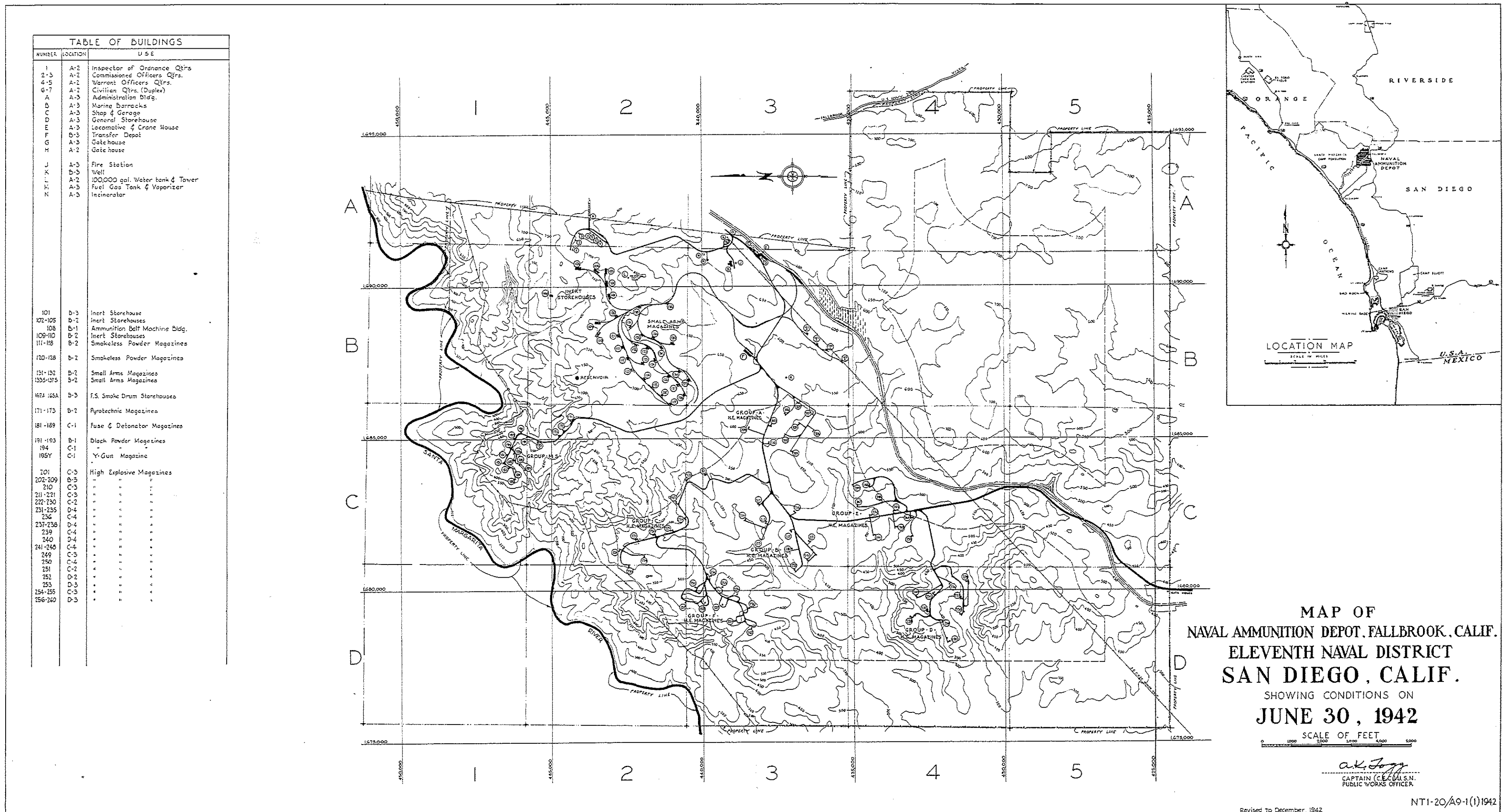
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NAVY

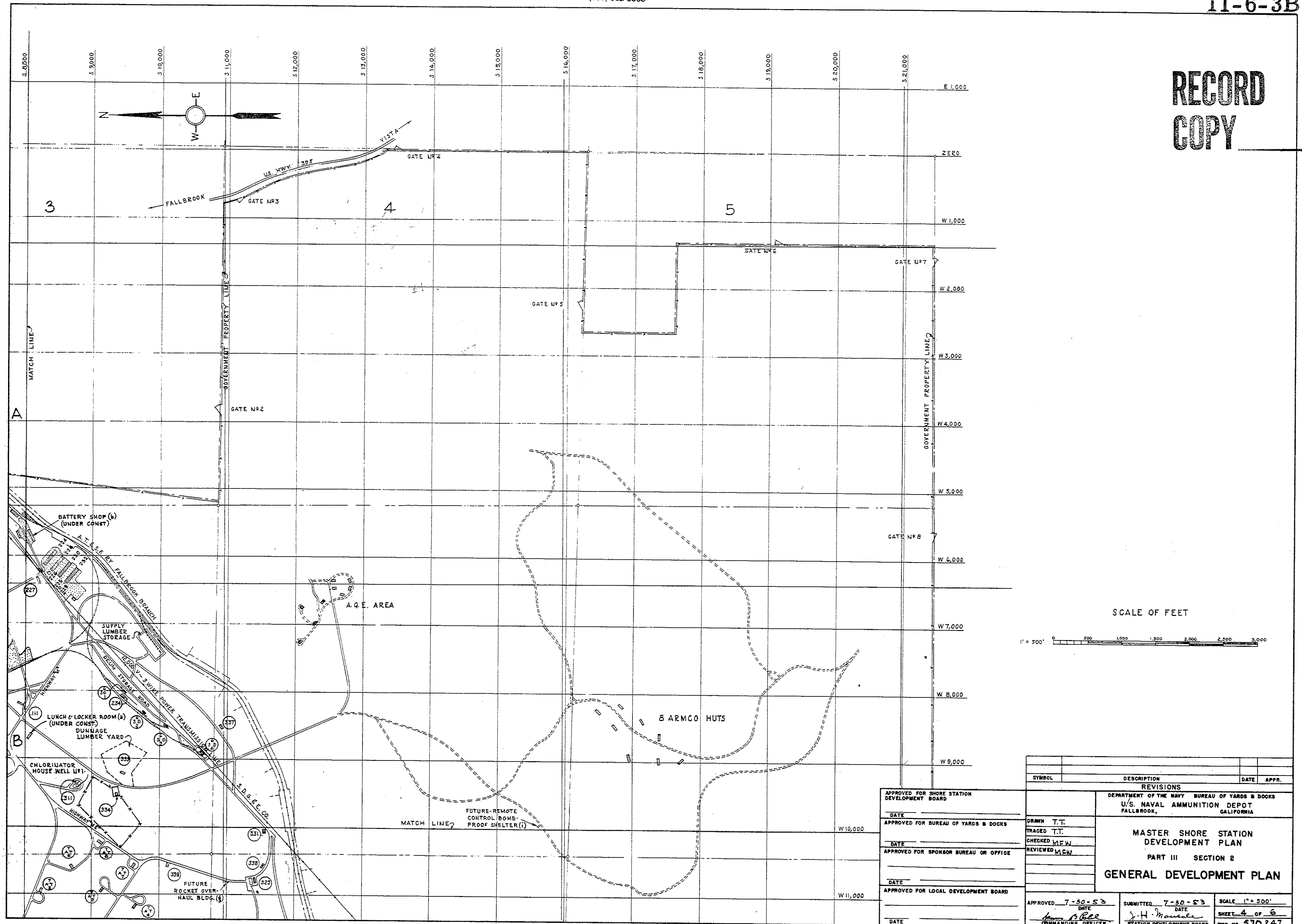
NAVY

NAVY



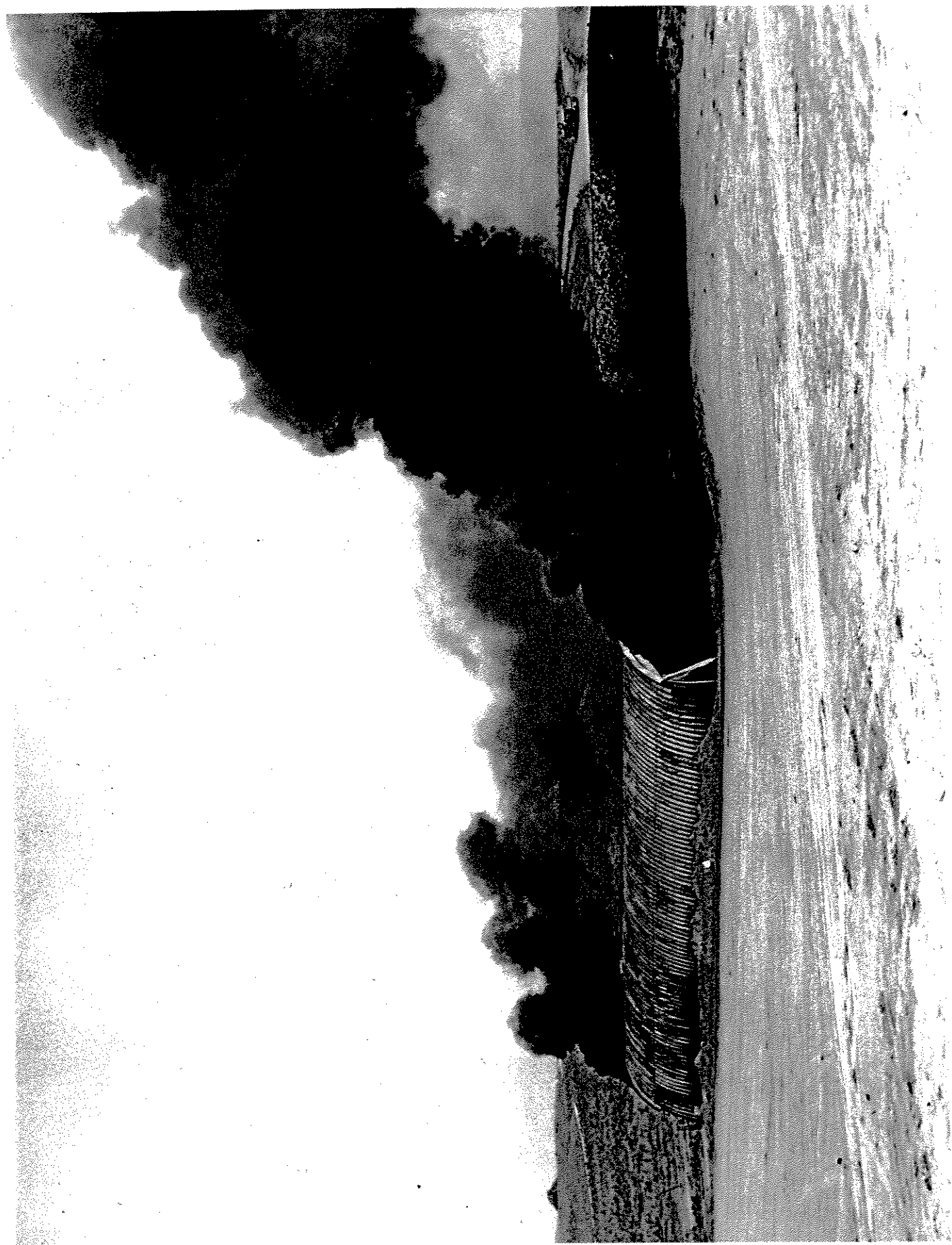
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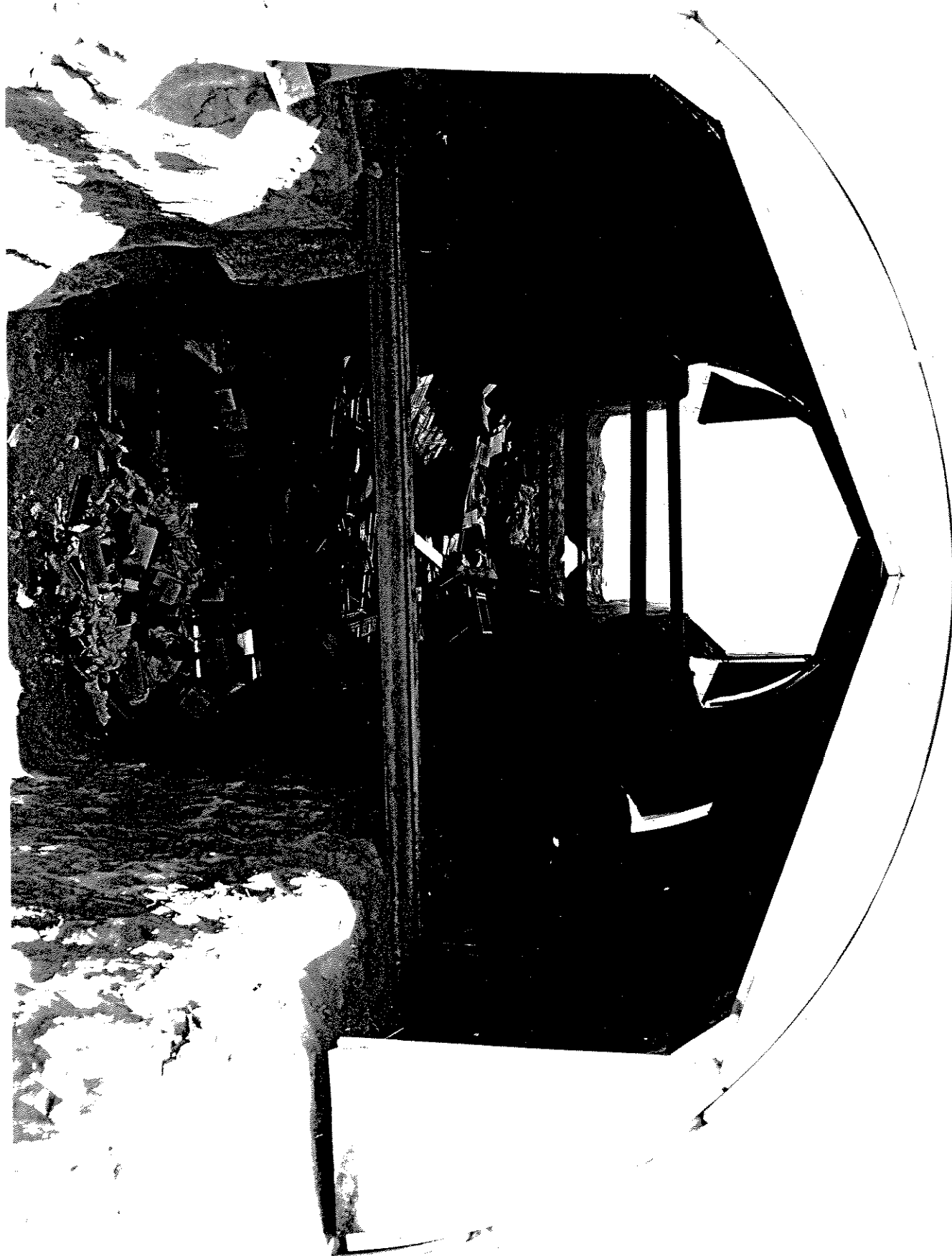
RECORD
COPY



SYMBOL	DESCRIPTION	DATE	APPR.
REVISIONS			
DEPARTMENT OF THE NAVY BUREAU OF YARDS & DOCKS			
U.S. NAVAL AMMUNITION DEPOT			
FALLBROOK, CALIFORNIA			
MASTER SHORE STATION			
DEVELOPMENT PLAN			
PART III SECTION 2			
GENERAL DEVELOPMENT PLAN			
APPROVED FOR SHORE STATION DEVELOPMENT BOARD		DATE	
APPROVED FOR BUREAU OF YARDS & DOCKS		DATE	
APPROVED FOR SPONSOR BUREAU OR OFFICE		DATE	
APPROVED FOR LOCAL DEVELOPMENT BOARD		DATE	
APPROVED 7-30-53		DATE	
SUBMITTED 7-30-53		DATE	
COMMANDED OFFICER		DATE	
STATION DEVELOPMENT BOARD		DATE	
DWR NO. 570247		SHEET 4 OF 6	

30 JUNE 1953





7 Aerial Coverage, Fallbrook, Calif. (080545)

DATE TAKEN:

27 MAY, 1949

SUBJECT:

U. S. MARINE CORPS AMMUNITION
DEPOT, FALLBROOK, CALIFORNIA.

FOCAL LENGTH:

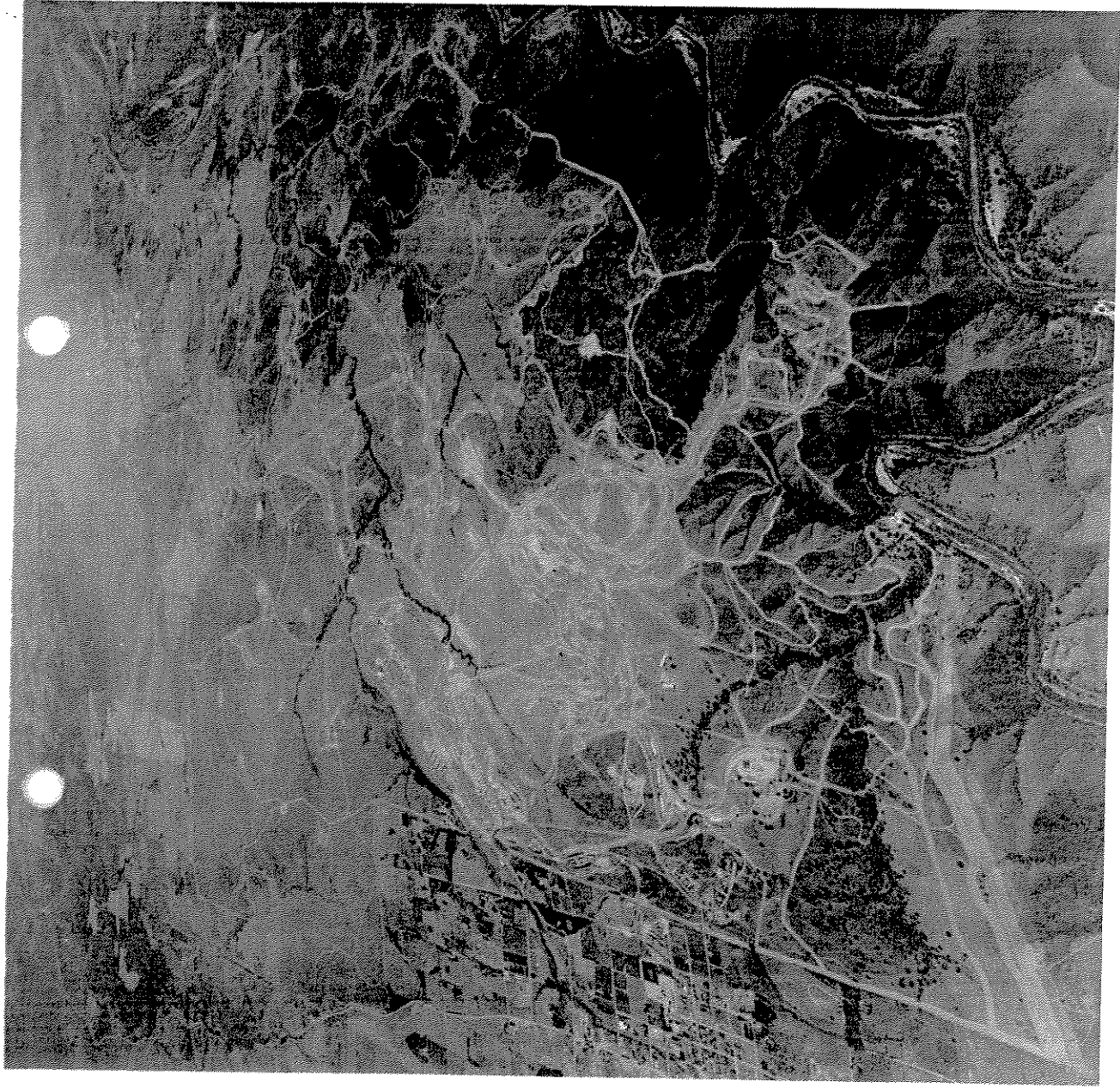
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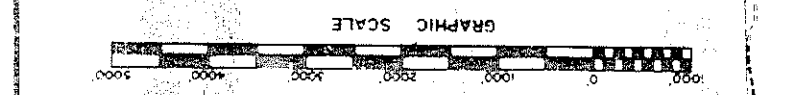
12,000'

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KV40-99



APPROVED BY BUDOCKS		SCALE GRAPHIC		1007679	
NO. 1007679-684 SUPERSEDES		Y&D DWG. NOS. 826487-488		Y&D DWG. NO.	
U.S. NAVAL WEAPONS STATION		FALLBROOK, CALIFORNIA		EXISTING & PLANNED PRE-M DAY	
GENERAL DEVELOPMENT		KEY MAP		Y&D DWG. NO.	
DEPARTMENT OF THE NAVY - BUREAU OF YARDS & DOCKS		DATE		APPROVED	
NO. 1007679-684 SUPERSEDES		Y&D DWG. NOS. 826487-488		Y&D DWG. NO.	



ACREAGE

AREA OF STATION - 0.8518 ACRES, GOVERNMENT OWNED

AREA OUTLEASED - 7.566 ACRES, LEASE NO. 10 (M) 61087 (GRAZING)

COMPONENT ACTIVITY

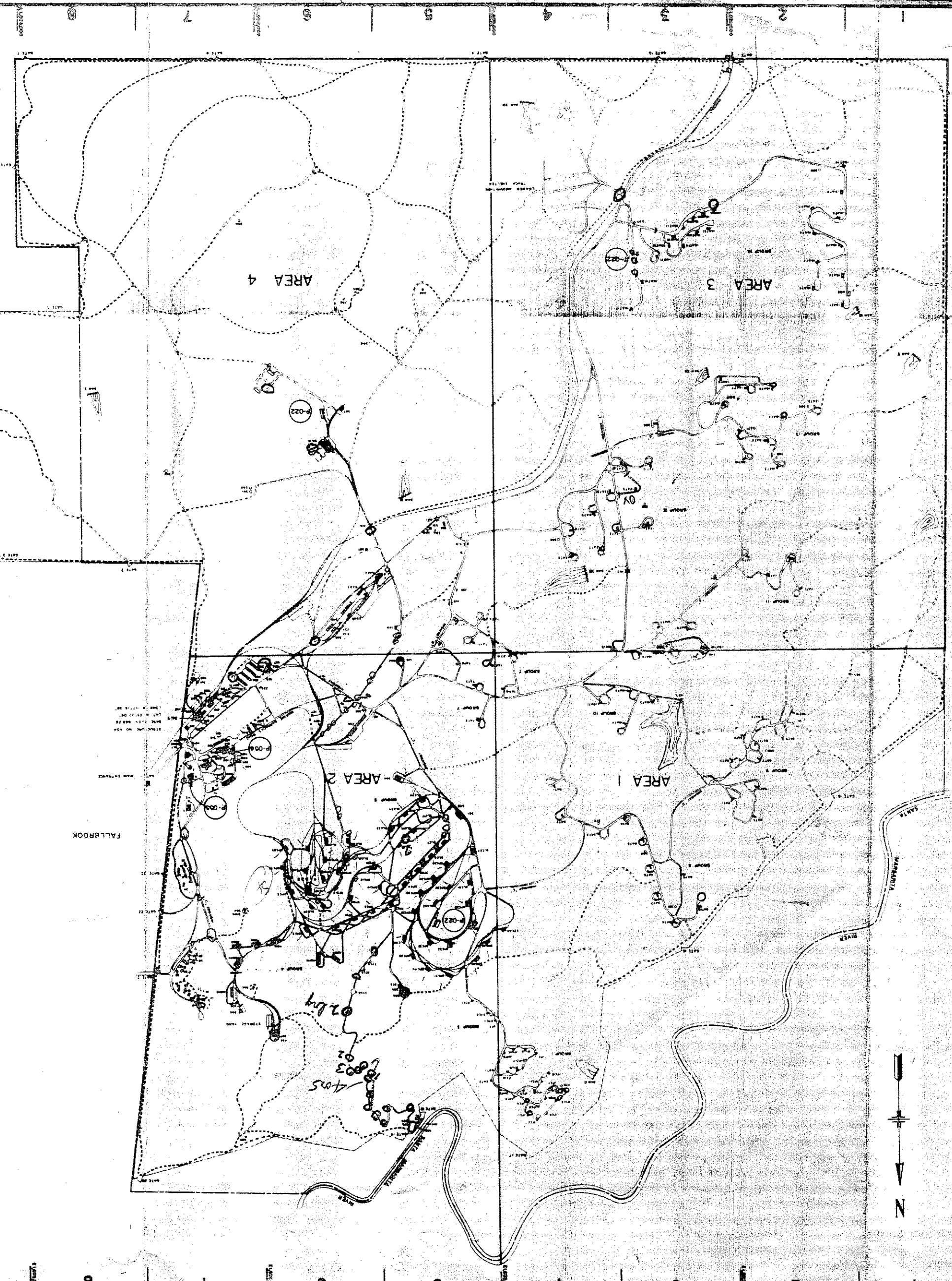
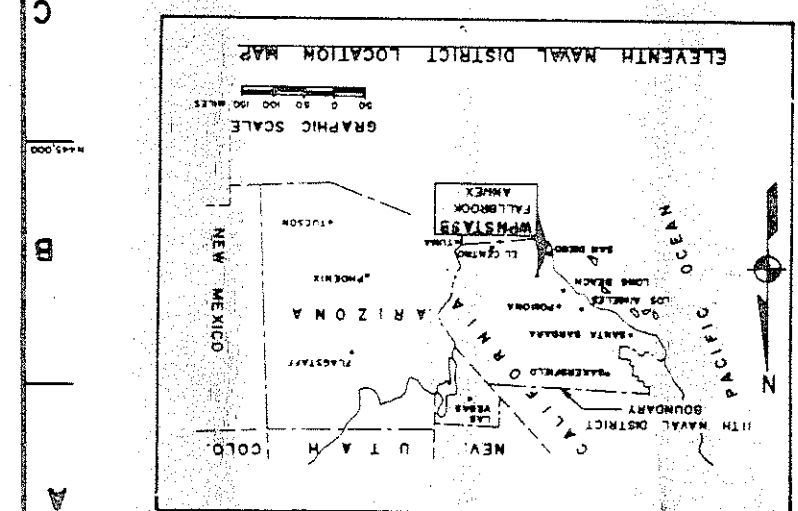
MARINE BARRACKS, FALLBROOK

SPONSOR: CMC

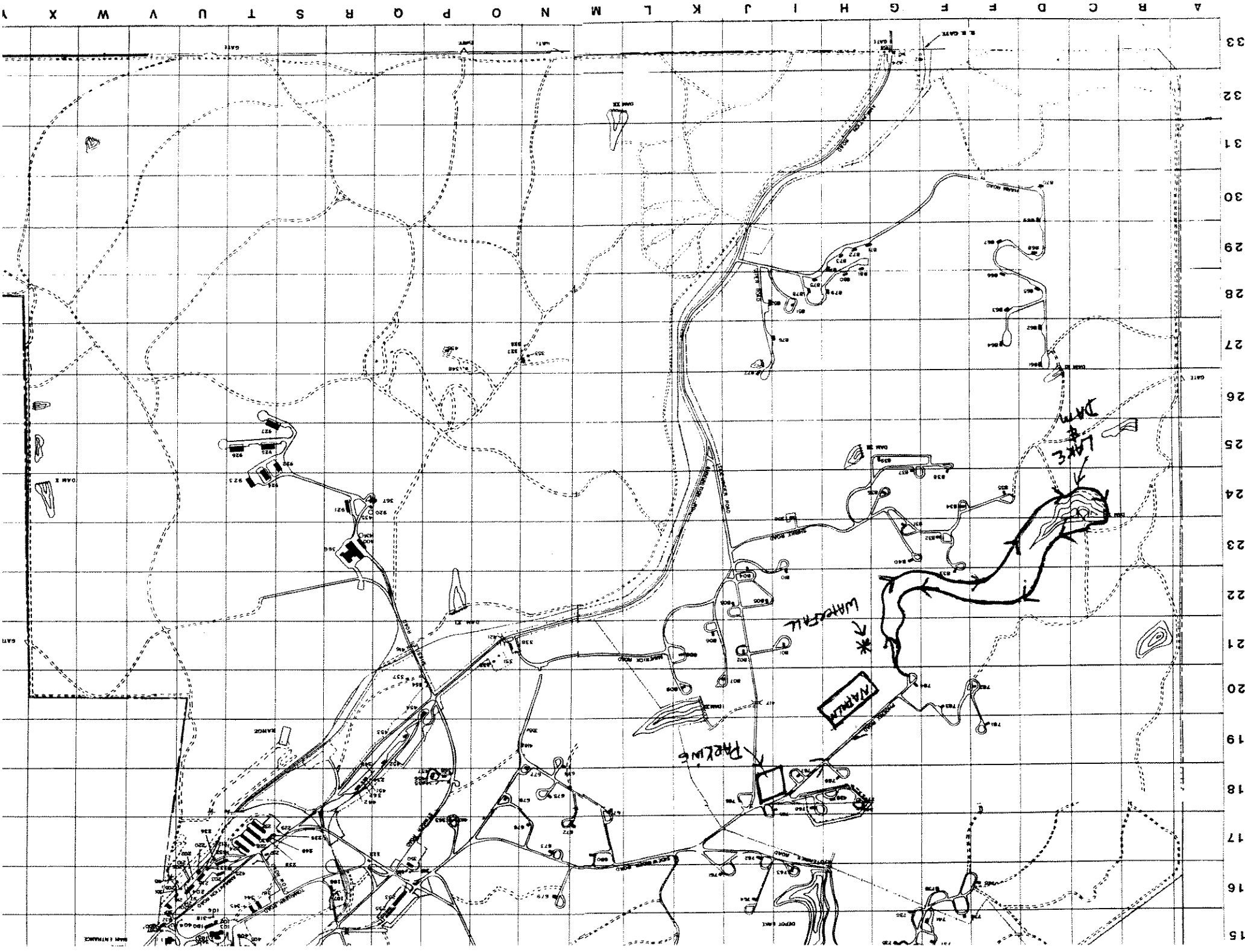
TENANT ACTIVITY

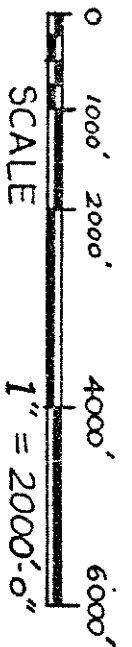
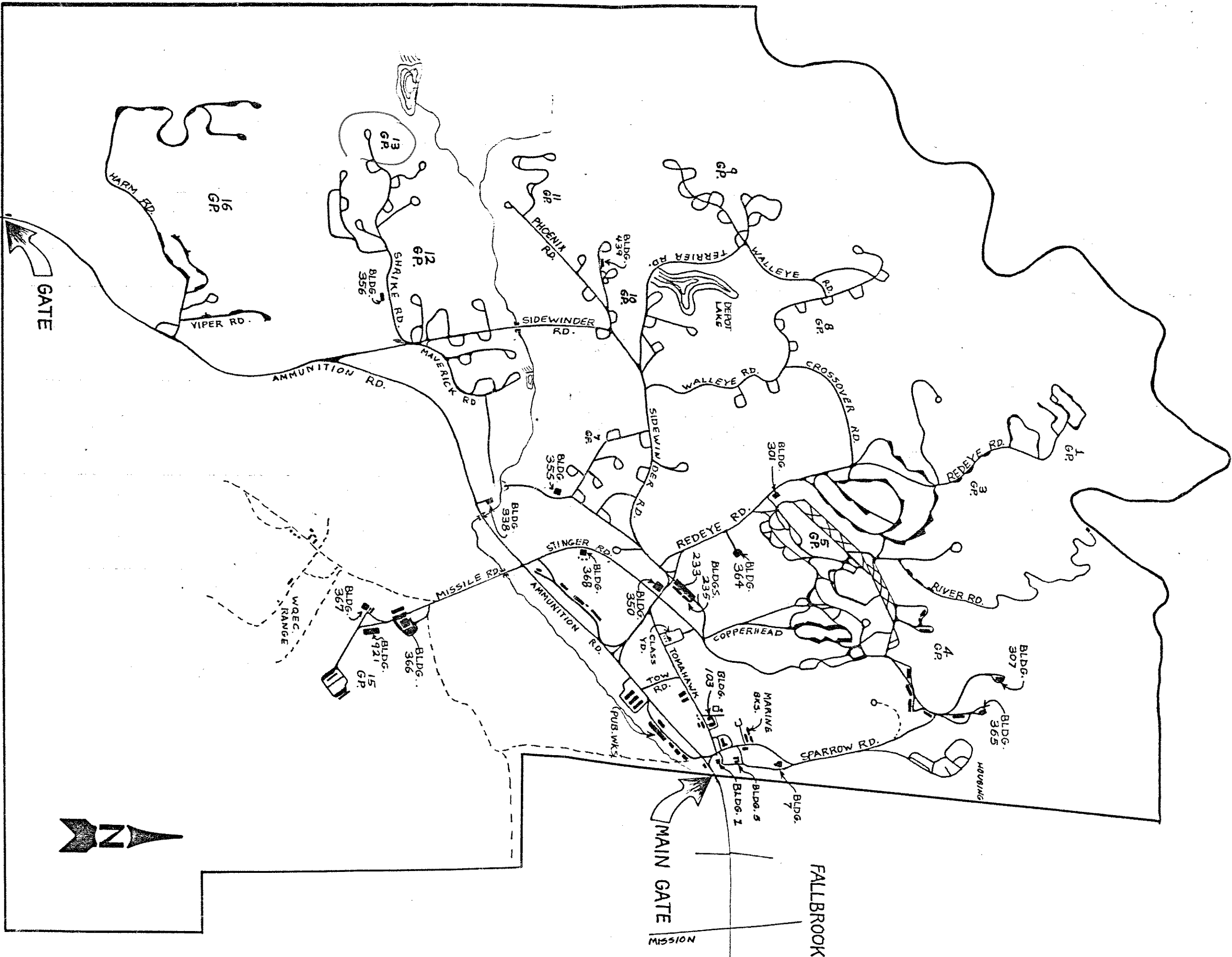
MARINE CORPS BASE, CAMP PENDLETON

SPONSOR: CMC



- LEGEND
- MARIANA RIVER
 - CAMP PENDLETON
 - NAVY PROPERTY BOUNDARY LINE
 - EXISTING FENCE
 - PLANNED FENCE
 - EXISTING BUILDING OR STRUCTURE
 - PLANNED BUILDING OR STRUCTURE
 - EXISTING ROAD AND PAVED AREA
 - PLANNED ROAD AND PAVED AREA
 - EXISTING DIRT ROAD
 - EXISTING RAILROAD
 - PLANNED RAILROAD
 - PROPOSED PROJECTS
 - EXISTING BRIDGE
 - EXISTING WATER TANK - FIRE
 - EXISTING WATER TANK - POTABLE
 - MAIN STATION ENTRANCE
 - EARTH DAM (CONSERVATION)





NUS FALLBROOK

ADDRESS REPLY TO
NAVAL AMMUNITION DEPOT
FALL BROOK, CALIFORNIA
AND REFER TO:



NAVAL AMMUNITION DEPOT
FALL BROOK, CALIFORNIA

✓
NTl-20/S77-1/L11-3
JSG:Ca (Serial 410)

30 April 1947

From: Commanding Officer, Naval Ammunition Depot, Fall Brook, California.
To: The Chief of the Bureau of Ordnance, Washington 25, D. C.

Subj: FS Smoke Mixture, Disposition of.

Ref: (a) NAD, Fall Brook Ltr. NTl-20/S77-1/L11-3 - Serial 211 - dtd
25 February 1947

1. Information is requested as to any contemplated action concerning
subject Smoke Mixture as requested in reference (a).

D. S. CRAWFORD

NAVY DEPARTMENT
BUREAU OF ORDNANCE

(Mnlb)

WASHINGTON, D. C.

NAVORD OCL X19-45
21 September 1945

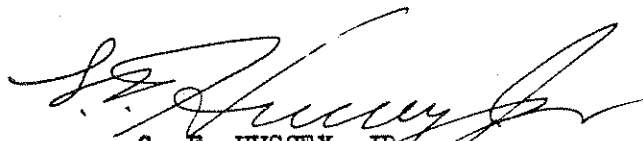
BUREAU OF ORDNANCE CIRCULAR LETTER X19-45

Subject: Obsolete and/or Bureau Surplus Inert Ordnance
Property - Disposition of.

Reference: (a) NAVORD OCL X10-45 dated 16 Jun 45.

Enclosures: (A) Obsolete and/or Bureau Surplus Underwater Ordnance
(Herewith) Property.
(B) Obsolete and/or Bureau Surplus Fire Control Ordnance
Property.
(C) Obsolete and/or Bureau Surplus Guns, Mounts, and
Associated Ordnance Property.

1. Ordnance property listed in enclosures (A), (B), and (C), herewith, is to be considered as additions to enclosures (A), (B), and (C) of reference (a) and is to be disposed of in accordance with the instructions contained in reference (a).


G. F. HUSSEY, JR.
Rear Admiral, U. S. Navy
Chief of Bureau

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Requests for additional copies of OCL X19-45 should be submitted on NAVORD FORM 1, ORDNANCE PUBLICATIONS AND FORMS REQUISITION, to the nearest Ordnance Publications Distribution Center: Navy Yard, Wash. 25, D.C.; Adak, Alaska; Mare Island, Calif.; Guam Island, Marianas; Pearl Harbor, T.H.; Subic Bay, P.I. Distribution Center mailing addresses should be obtained from List 10 nn of the Standard Navy Distribution List, or from the reverse side of NAVORD FORM 1.

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*Applicable Addressees

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NAVORD OCL X19-45
Enclosure A

Part 1

Underwater Ordnance Property
Obsolete and/or Bureau Surplus

CLASSIFIED

<u>Item No.</u>	<u>Description</u>	
1.	Float, Indicator, Mark 1 Mod 1.	(Note 1)
2.	Mechanism, EX, BuOrd Dwg. No. 134223.	
3.	Mechanism, Mine Firing, K-2, Mod 1.	
4.	Pistols, Depth Charge, Mark 9 and Mods 1, 2, 3.	
5.	Torpedo, Mark 11 All Mods.	
6.	Torpedo, Mark 12 All Mods.	
7.	Torpedo Tube, Deck Firing.	
8.	Torpedo Tube, Submerged, Mark 14 and Mark 15.	
9.	Torpedo Tube Mount, Triple, Mark 20.	(Note 2)

Note 1: Naval Net Depot, Tiburon to retain 737. All others to be disposed of.

Note 2: Activities are requested to advise Bureau of quantities on hand and disposition instructions will be issued.

Part 2

Underwater Ordnance Property
Obsolete and/or Bureau Surplus

NON-CLASSIFIED

<u>Item No.</u>	<u>Description</u>	
1.	Cage, Indicator Float, Mark 2 Mod 0.	(Notes 1 & 2)
2.	Float, Spherical, 8", BuOrd Dwg. 281760.	
3.	Net Panel, Light Indicator, BuOrd Dwg. 281670.	
4.	Stabilizer, Torpedo, Mark 2.	
5.	Stabilizer, Torpedo, Mark 5.	
6.	Stabilizer, Torpedo, Mark 9.	

Note 1: Activities are requested to advise Bureau of quantities on hand and disposition instructions will be issued.

Note 2: Bureau will direct specific activities to retain 720.

Note 2:

Bureau will direct specific activities to remove.

Part 1

NAVORD OCL X19-45
Enclosure B

Fire Control Ordnance Property
Obsolete and/or Bureau Surplus

CLASSIFIED

<u>Item No.</u>	<u>Description</u>
1.	Indicator, Torpedo Battle Order, Mark 3 and Mark 4.
2.	Mechanism, Gyro Setting, Marks 10, 12, 14, All Mods. (Note 1)
3.	Radar Equipment, Mark 3 and Mods. (Note 2)
4.	Radar Equipment, Mark 4 and Mods. (Note 2)
5.	Rangefinder, 43", Polaroid Experimental. (Note 2)
6.	Tracker, Automatic, Mark 1 & 2.
7.	Transmitter & Indicator, Torpedo Battle Order, Mark 4.
8.	Transmitter, Torpedo Battle Order, Mark 2.
9.	Transmitter, Torpedo Battle Order and Repeat Back Indicator, Marks 3 & 4.

Note 1: Retain Selsyns, Synchros, Motors, Relays.

Note 2: Advise Bureau of quantities on hand and disposition instructions will be issued.

Part 2

Fire Control Ordnance Property
Obsolete and/or Bureau Surplus

NON-CLASSIFIED

<u>Item No.</u>	<u>Description</u>
1.	Mount, Radar Antenna, Mark 4 Mods 0 & 1. (Note 1)
2.	Mount, Radar Antenna, Mark 6. (Note 1)

Note 1: Dispose of all in stock now and as removed from ships. Obsolete when all installations afloat are removed.

Guns, Mounts and Associated Equipment
Obsolete and/or Bureau SurplusCLASSIFIED

<u>Item No.</u>	<u>Description</u>	
1.	Gun, Machine, Caliber .50, M2, Browning, Watercooled Fixed and Flexible.	
2.	Gun, 3"/50 Cal., Mark 10.	(Note 1)
3.	Guns, 3"/50 Cal., Broadside, Single Purpose, All Marks and Mods.	(Note 1)
4.	Guns, 4"/50 Cal., All Marks and Mods.	(Note 1)
5.	Guns, 5"/50 Cal., All Marks and Mods.	(Note 1)
6.	Guns, 5"/51 Cal., All Marks and Mods.	(Note 1)
7.	Guns, 6"/50 Cal., All Marks and Mods.	(Note 1)
8.	Guns, 7"/45 Cal., All Marks and Mods.	(Note 1)
9.	Gun Mechanisms, 1"/10, Mark 1 Mods 0, 1, 2.	(Note 1)
10.	Mounts, 20MM, Mark 2.	(Note 1)
11.	Mounts, 20MM, Mark 4.	(Note 1)
12.	Mounts, 20MM, Mark 5.	(Note 1)
13.	Mounts, 20MM, Mark 6.	(Note 1)
14.	Mounts, 1"/10, Mark 2 and Mods.	(Note 1 & 2)
15.	Mounts, 3"/50 Cal., Single Purpose, All Marks and Mods.	(Note 1)
16.	Mounts, 3"/50 Cal., Dual Purpose, Mark 11.	(Note 1)
17.	Mounts, 4"/50 Cal., All Marks and Mods.	(Note 1)
18.	Mounts, 5"/38 Cal., Twin Single Purpose, Mark 22 and Mods.	(Note 3)
19.	Mounts, 5"/50 Cal., All Marks and Mods.	(Note 1)
20.	Mounts, 5"/51 Cal., Dry, All Marks and Mods.	(Note 1)
21.	Mounts, 5"/51 Cal., Wet, All Marks and Mods.	
22.	Mounts, 6"/50 Cal., All Marks and Mods.	(Note 1)
23.	Mounts, 6"/53 Cal., Mark 13 & 17 All Mods.	(Note 4)
24.	Mounts, 6"/53 Cal., Wet, Mark 17 Mod 1.	
25.	Rail Assemblies for Rocket Launchers, Mark 35 Mod 0.	
26.	Shields, 5"/38 Cal., Open Top Type, (10 lb. Plate).	

Note 1: Dispose of all in stock now and as removed from ships. Obsolete when all installations afloat are removed.

Note 2: Naval Ammunition Depot, Crane, to retain 25. Dispose of all others ashore and as removed from ships afloat.

Note 3: Activities are requested to report quantities on hand to the Bureau and proper disposition instructions will be issued.

Note 4: Naval Gun Factory to retain 25. Dispose of all others ashore and as removed from ships afloat.

FILE

110:sh
18-5/1
29 Oct 1958

MEMORANDUM

From: Officer in Charge
To : Commanding Officer

Subj: Diving Operations Involving Explosives at
Fallbrook Annex; request for

1. It is requested that the Explosive Ordnance Disposal Officer conduct diving operations in the Main lake and West lake at Fallbrook Annex to salvage explosives from the lakes. Fallbrook Annex personnel can provide exact locations.

2. Civilian Ordnancemen at Fallbrook Annex state that the following types of ammunition are known to have been dumped in these two lakes during World War II:

- a. 20 mm cartridges
- b. 40 mm cartridges
- c. 60 mm cartridges
- d. 7.2 projector charges (Hedge-hog)

It is possible other types of ammunition were dumped. The Ordnancemen further state that small quantities of the above types of ammunition have been recovered from the lakes during dry summer seasons since World War II, and were disposed of by burning or deep water dump.

3. Salvage of the above ammunition is recommended now to prevent possible future casualties in the event repairs to dams or other construction work is required in the vicinity of the lakes. (An auxiliary fire-fighting water main is installed on a wooden pier at the location of dumped explosives in the Main lake.)

Very respectfully,

M. C. SLEDGE

Copy to:
Ord Off (Seal Beach)
Asst Ord Off (Fallbrook Annex)

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REPLY TO LTR. ON ROUTE SHEET NO.		

Commanding Officer

WFL-20/LL

WMT:Gr (Serial 1438)

30 October 1946.

To: Area Wage and Classification Office, Room 604, Federal Building,
Third and American Avenue, Long Beach 2, California.

Subj: NAD, Fall Brook - Mission of.

Ref: OIR lettr OIR:495.15-HAS-rr dtd 24 October 1946.

1. In reply to reference (a) the following information is furnished:

a. In accordance with the statement of the Bureau of Ordnance the Depot will stock and issue all types and calibers of ammunition for the San Diego area, except 6"/53, 8", 14", and 16" caliber ammunition. In addition the Naval Ammunition Depot, Fall Brook, will supply bombs to activities in the San Pedro as well as the San Diego Area and to the Naval Ammunition and Net Depot, Seal Beach when required for vessels in the San Pedro Area.

b. The following departments within the organization of the Depot are established:

- (1) Administration Department - Coordination of Depot Activities.
- (2) Ordnance Department - Technical stowage and care of ammunition.
- (3) Maintenance Department - Upkeep of buildings, grounds and utilities.
- (4) Transportation Department - Maintenance, upkeep, dispatching, and routing of automotive equipment and railroads for deliveries and receipt of ammunition and supplies to both intra and inter Depot points.
- (5) Security and Communications Department - Supervision of the Fire Department; Communications; Issuance of Passes to authorized personnel.
- (6) Supply, Disbursing and Accounting Office - Preparation of vouchers, bills of lading, civilian and military pay rolls, control of appropriation allotments, material, supplies, et cetera.
- (7) Dispensary - Medical care of officers and enlisted personnel and Depot residents; inspection of sanitary facilities, water supply, etc.; Treatment of industrial accidents.

A4-2

1-
P16-1/1

DEPARTMENT OF THE NAVY

Memorandum

DATE: 29 Nov 1979
#165-04:PR:dws
11000

FROM : Code 04

TO : Code F-335

SUBJ : Siting Proposal (Proposed Firing Range Magazine and Building Distances)

REF: (a) Code F-335 memo, same subject dtd 19 Oct 1979
(b) NAVSEA OP 5, Vol. 1

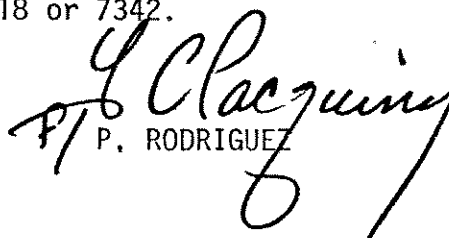
1. In response to reference (a), subject proposal has been reviewed by the Safety Department and the following comments are furnished:

a. Properly constructed barricades are an effective means of protecting ammunition and explosives, structures or operations against high velocity low angle fragments, although the barricades may be destroyed in the process; reference (b), paragraph 5-4.1.3 applies. To preclude building excessively high barricades, the barricade should be located as close as possible to the stack (i.e., ammunition or explosive) without interfering with normal operations. Recommend the placement of the barricade be immediately behind the firing point. If it is necessary to observe actions at the firing point, a remote monitoring unit should be installed.

b. The proposed location of the magazines and buildings complies with Explosive Quantity distance standards. In order to properly evaluate the placement of sighting shelters, the following additional information is required:

- (1) Type of armor
- (2) Type of vision
- (3) Type of ports

2. Any questions regarding the above information may be directed to the Safety Director at extension 7318 or 7342.


P. RODRIGUEZ

Copy to:
30

Memorandum

F335;WV:san
8090
DATE: 19 Oct 1979

FROM: F335


TO: 04

SUBJ: Siting proposal

Encl: (1) Proposed Firing Range Magazine and Building Distances

1. Enclosure (1) is forwarded for your review and comment. Ammunition items to be test fired include 40MM through 66MM. In addition, component test firing of Non-HE 60MM through 155MM projectiles will be performed.

2. Request comments no later than 12 November 1979 as siting must take place prior to FY-80 testing.


for J. D. GARLAND
Head, Marine Corps Programs Branch

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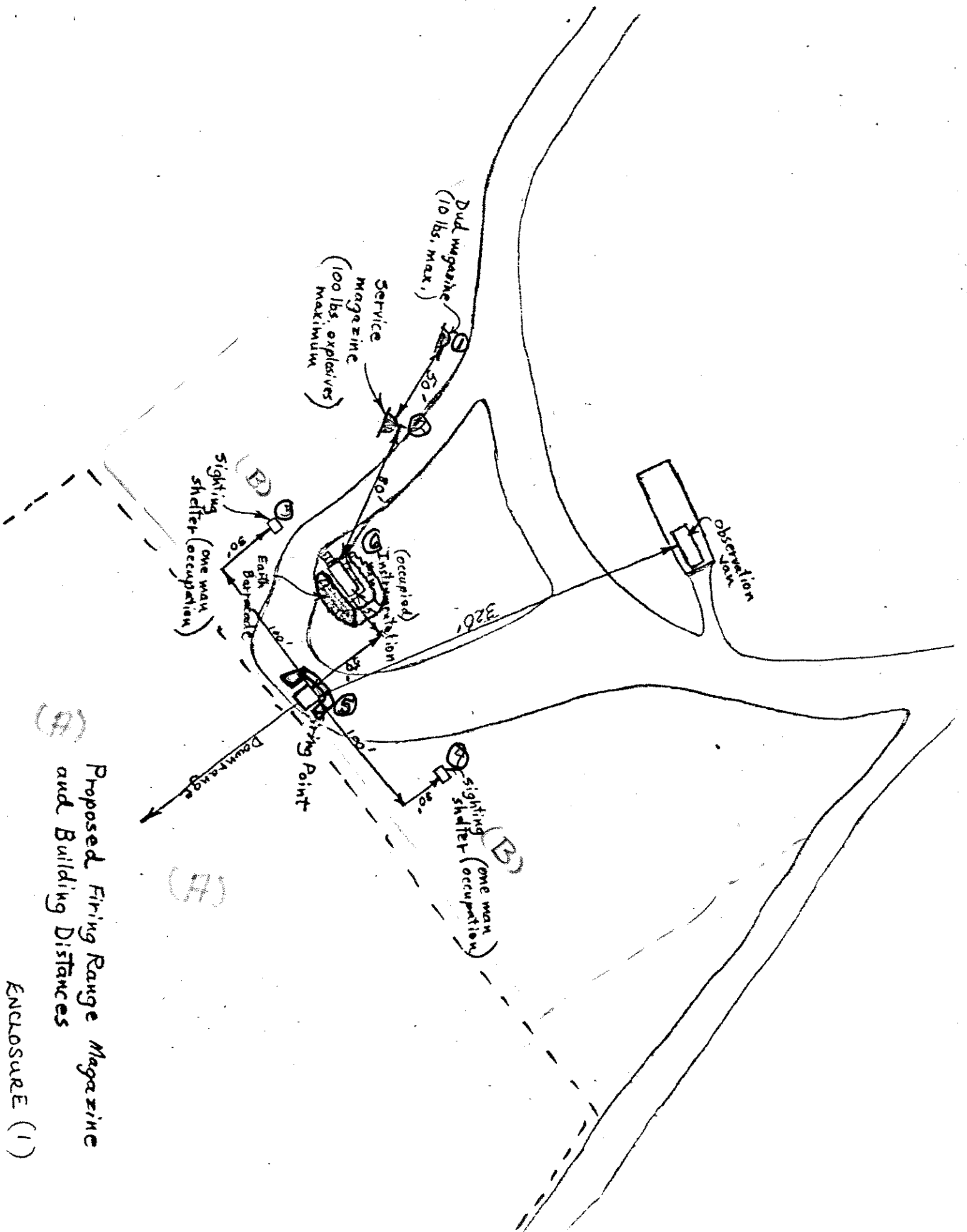
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Ventuleth ←

Moody

3014 (2)



Proposed Firing Range Magazine
and Building Distances

ENCLOSURE (1)

Memorandum

F335;WV:san

8090

DATE: 19 Oct 1979

FROM: F335

TO: 04

SUBJ: Siting proposal

Encl: (1) Proposed Firing Range Magazine and Building Distances

1. Enclosure (1) is forwarded for your review and comment. Ammunition items to be test fired include 40MM through 66MM. In addition, component test firing of Non-HE 60MM through 155MM projectiles will be performed.

2. Request comments no later than 12 November 1979 as siting must take place prior to FY-80 testing.


for J. D. GARLAND
Head, Marine Corps Programs Branch

Copy to:

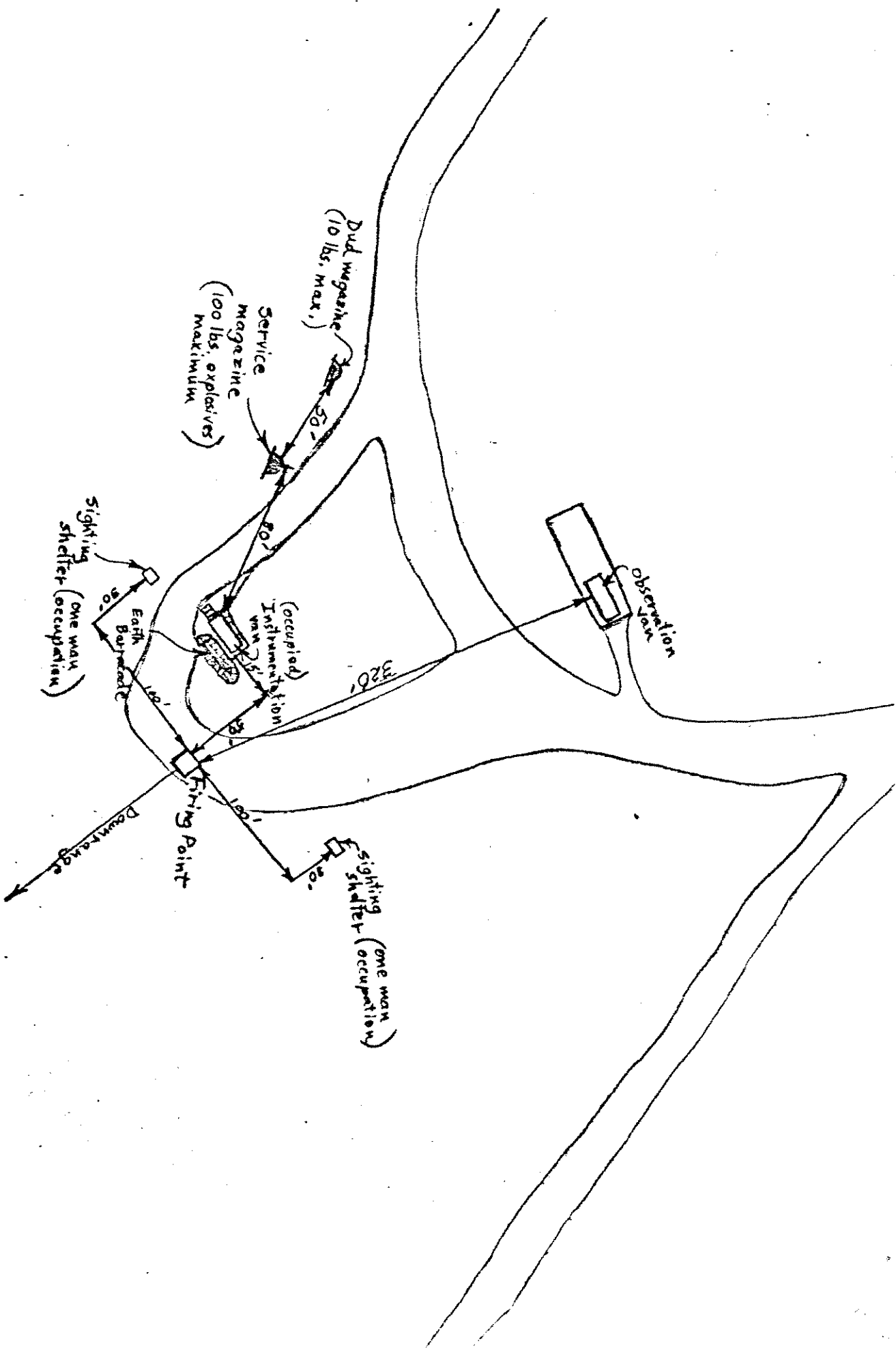
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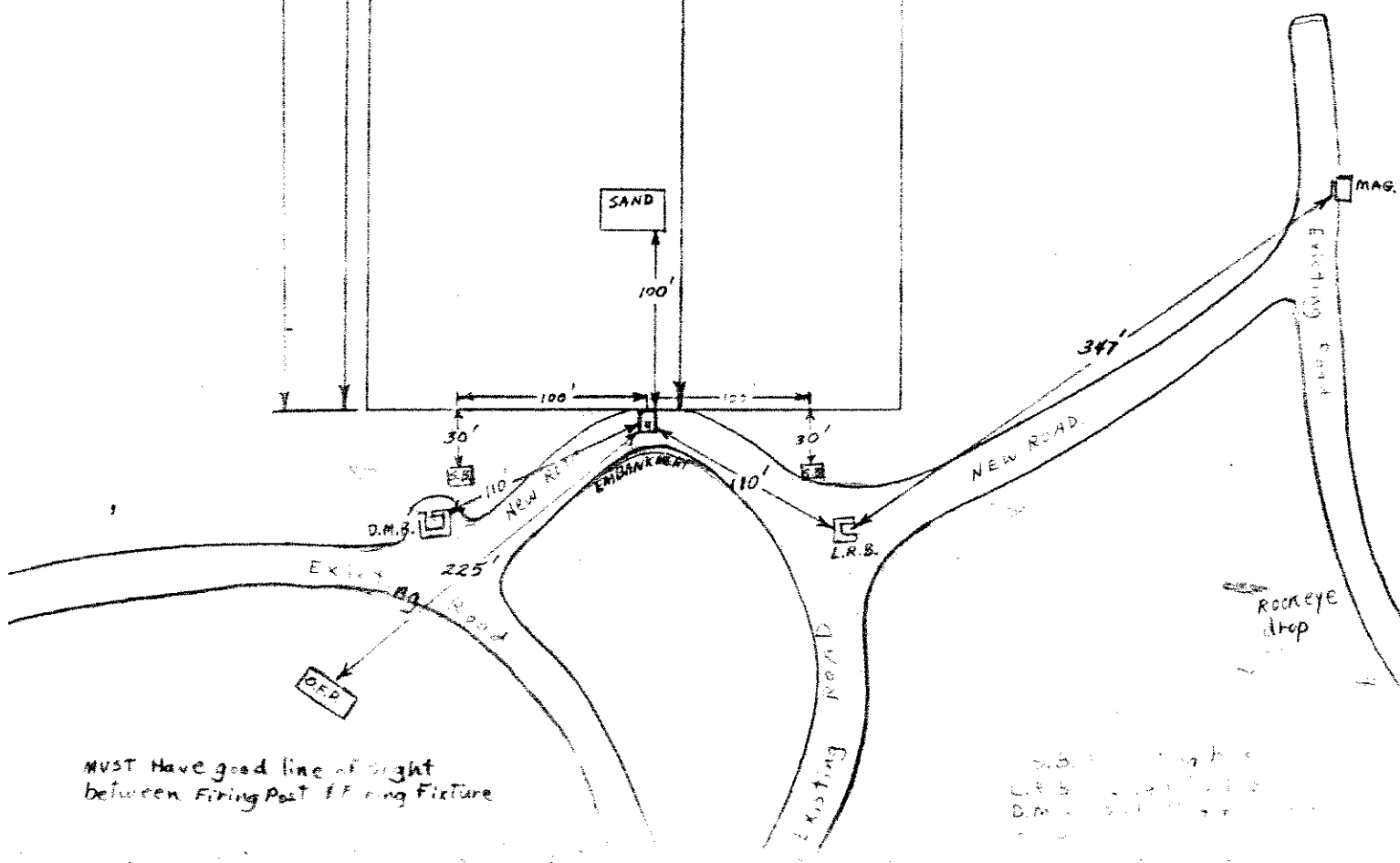
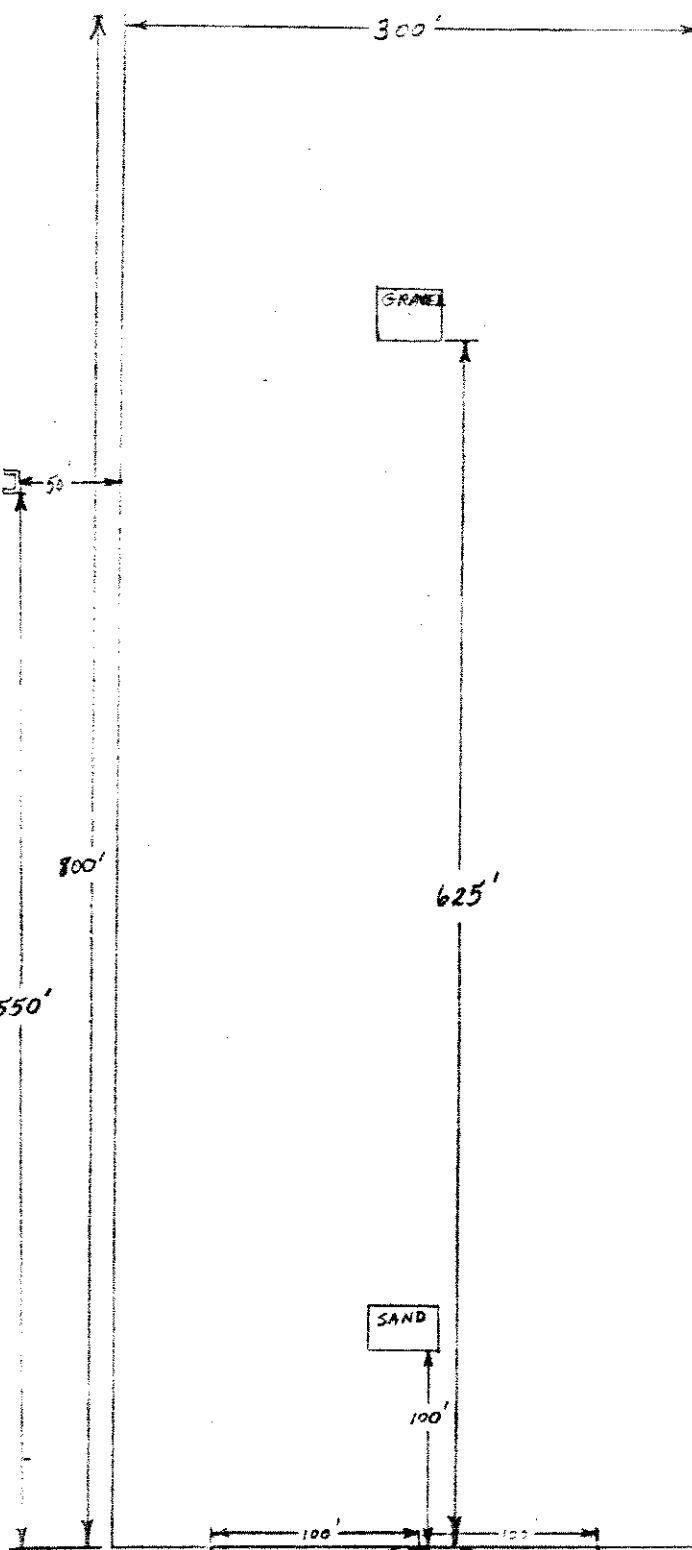
Ventuleth

Moody ←

3014 (2)



Proposed Firing Range Magazine
and Building Distances



Join existing road here

yellow stake

Gradual slope in road

EMBANKMENT

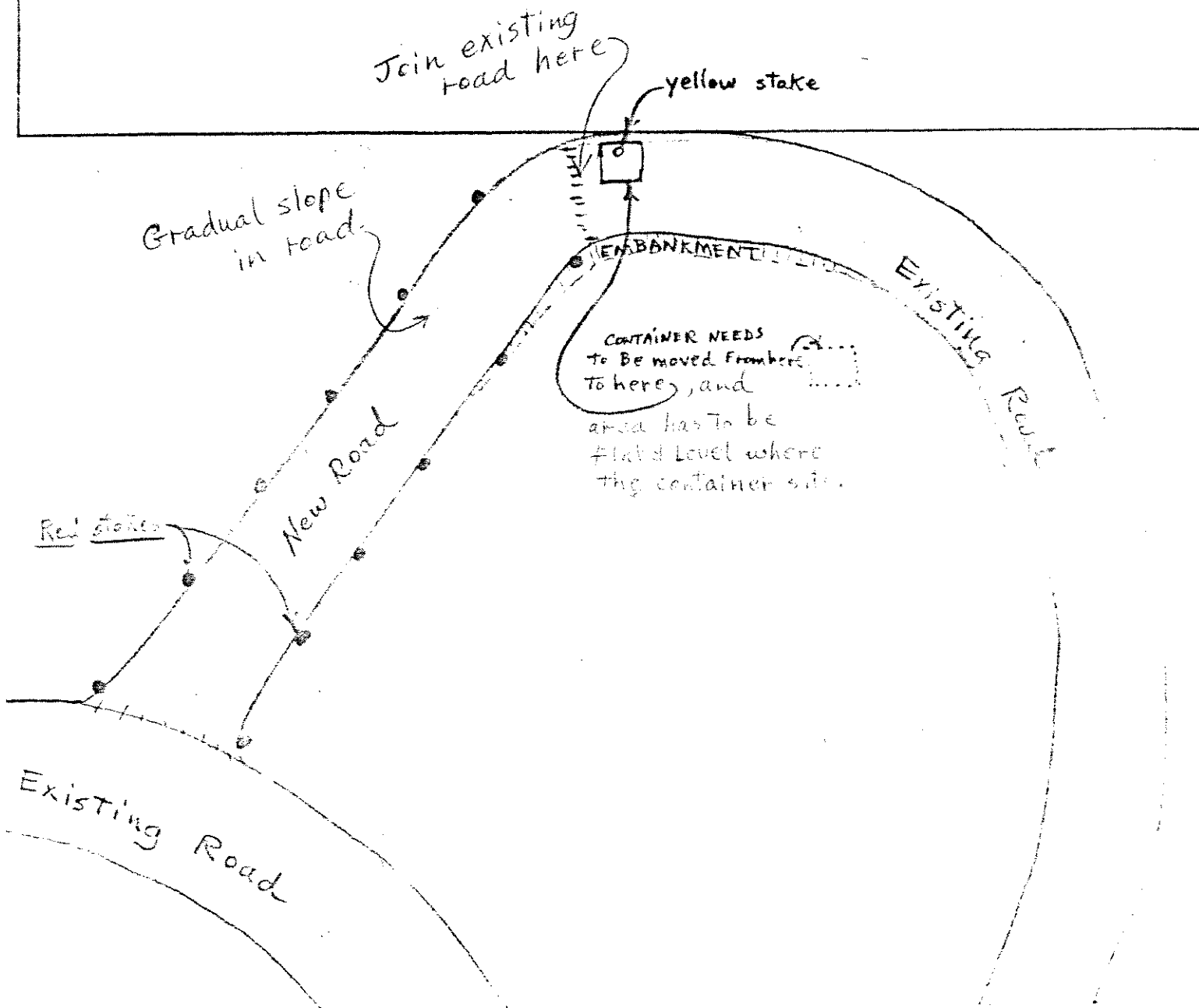
CONTAINER NEEDS
To Be moved from here
To here, and
area has to be
flattened level where
the container sits.

Red stakes

New Road

Existing Road

Existing Road





DEPARTMENT OF THE NAVY
NAVAL WEAPONS STATION
SEAL BEACH, CALIFORNIA 90740

20A file

IN REPLY REFER TO:

164:LRB:jes

8000

Ser 2381

13 NOV 1975

From: Commanding Officer, Naval Weapons Station, Seal Beach, CA. 90740
To: Commander, Naval Sea Systems Command (Code 9912)

Subj: Navy Explosive Safety Waivers and Exemptions; correction of

Ref: (a) COMNAVSEASYSCOM msg 011939Z Oct 75

Encl: (1) Naval Weapons Station, Seal Beach, Safety Waivers and Exemptions; status of corrective actions for

1. In accordance with reference (a), enclosure (1) is submitted herewith.

H. P. Madera

H. P. MADERA
Acting

Copy to:
NAVSEA (Code 07011)

61C

20 ✓

04

09

290

F

Return to 365

NAVAL WEAPONS STATION, SEAL BEACH
SAFETY WAIVERS AND EXEMPTIONS;
STATUS OF CORRECTIVE ACTIONS FOR

CATEGORY A - ENTIRE ELIMINATION OF WAIVER/EXEMPTION

1. WAIVER NO. 3, Automatic Sprinkler Systems in Explosive Buildings. This is not an ESQD waiver.

<u>a. Status of Corrective Action</u>	<u>Est. Cost</u>
Bldg 114, Point Loma	Completed
94	Special Project C1-74, submitted 27 Sep 73
	\$37,800
74, 102, 901	Special Project C2-74, submitted 24 Sep 73
	40,100
235 (old 233A, 233B)	Special Project C3-74, submitted 18 Oct 73
	36,900
433	Function will be trans- ferred to Fallbrook Annex. Waiver will not be required after transfer is completed- 1977.
365, Fallbrook	Special Project is being prepared.
	18,000

2. WAIVER NO. 6, (Bldg 78) Tenancy of Data Processing and Training Classroom in TALOS operations building. This is an ESQD waiver.

a. Special Project E2-74 to relocate Data Processing operations from Bldg 78 to Bldg 112 submitted 7 Nov 75. \$70,700

b. Training Classroom is no longer being used. Large assemblies meet in the Station theatre; this portion of waiver has been corrected.

3. EXEMPTION NO. 1, Explosive Safety Limits - Limits explosives at the Station wharf to 125,000 lbs of Class 7 explosives. This is an ESQD exemption.

a. Seal Beach MILCON P-064, Ammunition Pier and Bypass Channel submitted 30 June 75 to eliminate this exemption. This MILCON is a double purpose project: (1) to eliminate the explosive exemption at the Station wharf, and (2) to eliminate the non-Navy boat traffic in and out of Anaheim Bay, which poses safety hazards and security threats.

b. <u>Total estimated cost</u>	<u>\$29,308,000</u>
\$6,382,000	Pier
8,654,000	Causeway & Jetty
14,272,000	Bypass Channel

4. EXEMPTION NO. 5, Storage of Guided Missiles. This is not an ESQD exemption.

a. This exemption was granted to permit the storage of war-headed missiles and torpedoes in SP&P type magazines. The explosive load limit of the (7) magazines exempted is reduced to 56,000 lbs of Class 7 items.

b. Seal Beach MILCON P-014, Guided Missile Magazines, has been submitted and is included in the Military Construction Program Objectives Report 1360.

c. Estimated Cost - \$268,000

5. EXEMPTION NO. 8, Conveying Non-Containerized Explosive Missile Material over Public Highways. This is not an ESQD exemption.

a. This exemption was granted to permit conveying non-containerized missiles, on intra-station movements, across Westminster Avenue, which bisects the station.

b. Seal Beach MILCON P-036, Underpass of Westminster Avenue, submitted to eliminate this exemption. P-036 is included in the Military Construction Program Objectives Report 1360.

c. Estimated Cost - \$677,000

6. EXEMPTION NO. 9, Quantity Distance Requirements for Point Loma Detachment. This is an ESQD exemption.

a. NAS North Island MILCON P-800, Ammunition Pier and Facilities, submitted to eliminate the exempted interim Point Loma operations. This project will consolidate existing ordnance handling and storage facilities from Point Loma to the existing magazine area at North Island.

b. Estimated Cost of NAS North Island MILCON - \$11,956,000

7. EXEMPTION NO. 11, Use of Gun Type Ammunition Magazine for preparation of small shipments. This is not an ESQD waiver.

a. NWSSB MILCON P-031, Ammunition Transfer Depot, updated and submitted 11 Nov 74. P-031 is included on the Military Construction Program Objectives Report 1360.

b. Estimated Cost - \$984,000

CATEGORY C - EXEMPTIONS WHICH ARE IMPRACTICAL TO RELIEVE OR ELIMINATE

1. EXEMPTION NO. 4, Personnel Limits in Explosive-Laden Vehicles. This is not an ESQD waiver.

Missile handling procedures and operational safety requirements dictate the need for three persons in a missile handling crew. The limited number of vehicles assigned the Station, vehicle operating costs and fuel conservation justify continuation of this exemption. Three persons are permitted on the truck for intra-station operations only. It is recommended this exemption be continued.

2. EXEMPTION NO. 6, Location of Station Skeet/Pistol Range. This is an ESQD exemption.

a. The Skeet/Pistol Range is located approximately 800 ft from an ammunition segregation building (Bldg 402). The explosive limit of Bldg 402, 95,000 NEW, imposes an ESQD arc of 1095 ft, ref OP-5, 5-5.7.4.

b. The Pistol Range is used by Station military and civilian personnel for handgun marksmanship training in support of Station security and courier requirements. Intermittent use of the range by local law enforcement officers has been authorized and has done much to promote Navy/Community relations.

c. The Skeet/Trap Range within this location is limited to the Station Rod and Gun Club members, who meet periodically after normal work hours.

d. There is no other area on the Station to relocate the Skeet/Pistol Range. The only alternative, to eliminate this exemption, is to close the range. Since written safety precautions are rigidly enforced during the use of the range, it is recommended that this exemption be continued.

3. EXEMPTION NO. 10, Quantity Distance Restrictions for Magazines 801, 806, 851, 862, and 865 (Cell #1 and #2). This is an ESQD exemption.

a. The NEW storage limitation on these magazines has been reduced to 30,000 lbs, Class 7, which is far less than their design capacity. From 0-30,000 lbs NEW requires a distance (public highway) of 745 ft. These magazines are needed for HE storage items to support Fleet requirements. OP-5, Fourth Revision, specifies 745 ft, public highway distance, required for Class 7 items. Four magazines are located 700 ft from Westminster Avenue (public highway), one magazine is located 670 ft from the public highway right-of-way fence.

b. Operational/mission accomplishment is not being compromised by the reduced storage capacity of these magazines. Accordingly, it is recommended the exemption be continued with construction of 5 HE-type magazines at an estimated cost of \$1 million.

4. EXEMPTION NO. 7, Use of Building 365, Fallbrook Annex, as an Explosive Production Building. This is an ESQD exemption.

a. Bldg 365 is an explosive production building located 750 ft from an inhabited building. The REDEYE missile surveillance program, conducted by WQEC, is performed in this building. The maximum NEW in this building is approximately 9 to 10 lbs at any one time.

b. OP-5, Fourth Revision, requires 1245 ft, inhabited building distance, for Class 7 items from 0-30,000 lbs NEW.

c. There is no other existing facility available to relocate the REDEYE surveillance function. It is considered impractical to construct a new facility, in order to eliminate this exemption, because of the small amount of NEW handled.

d. It is anticipated that, within a few years, additional WQEC explosive surveillance programs will be conducted for DRAGON, STINGER, and HAWK missiles. These new programs, along with the REDEYE surveillance program will necessitate a new facility construction program which will eliminate exemption No. 7.



DEPARTMENT OF THE NAVY
NAVAL SEA SUPPORT CENTER, PACIFIC
POST OFFICE BOX 80548
SAN DIEGO, CALIFORNIA 92138

RS# 1034
IN REPLY REFER TO:

8100:JFG:yh

Ser 1660

17 OCT 1975

FIRST ENDORSEMENT on CO NAWPNSTA SEAL BEACH ltr 20A:LDS:mb 8020 Ser 2037
of 2 October 1975

From: Commanding Officer, Naval Sea Support Center, Pacific
To: Chief of Naval Operations (OP-411)
Via: Commander, Naval Sea Systems Command (SEA-04H)

Subj: Renewal of Waiver No. 3; Sprinkler System Requirements (RS: OPNAV
8023-5)

1. Forwarded, recommending renewal of Waiver No. 3 as requested.

J. D. DAVIDSON

Copy to:
CO NAWPNSTA SEAL BEACH

File 8000 Due Date
Action/Prime Code 20
Info Codes: A-B-161-04-09

SECURITY DEPARTMENT
U. S. NAVAL AMMUNITION & NET DEPOT, SEAL BEACH
FALLBROOK ANNEX
FALLBROOK, CALIFORNIA

RQB/RLR:hls
5500
10 May 1960

From: Security Officer
To: Officer in Charge

Subj: Apprehension of Annex trespasser, report of

Ref: (a) Internal Security Act of 1950
(b) OPNAV INST 05510.25C
(c) OPNAV INST 5510.45
(d) OPNAV INST 5511.9A
(e) NAD FB INST 5500.3B
(f) NAD FB INST 5540.1
(g) MBO 5510.1C
(h) Operation Order 1-58 (MB NAD Fallbrook)

1. References (a) through (h) govern the operation of the Security Department of this Annex.

2. Statements of incidents:

a. The following incidents and actions taken, occurred at the U. S. Naval Ammunition & Net Depot, Seal Beach, Fallbrook Annex, Fallbrook, California on 7 May 1960:

- 0750 - On going Cpl of Guard (0800 to 1200 relief) while posting relief picked up an unidentified Male by 6 Group, (On the rail road tracks across from the Annex Pistol Range.
- 0755 - Unidentified person arrived at Main Gate with on going guard relief. Junior Navy Duty Officer at Main Gate at this time.
- 0757 - Marine Officer of the Day arrived at Main Gate.
- 0803 - Unidentified Man shaken down by Marine Officer of the Day. No identification. Suspect gave his name as "John Doe". Negative results on shakedown.
- 0805 - Mr. SCANLON, FBI, notified by phone by Marine Officer of the Day. Officer LUALLIN, California State Highway Patrol notified (no response by phone for Deputy Sheriff Fallbrook). Suspect talked on phone to FBI agent Mr. SCANLON. Suspect gave his name as Walter Stanley STEPANIC.
- 0825 - Security Officer notified.
- 0838 - Officer LUALLIN arrived at Main Gate.
- 0840 - Officer LUALLIN notified San Diego County Deputy Sheriff Gene COWLEY by radio.

FILE

110:sh
18-5/1
29 Oct 1958

MEMORANDUM

From: Officer in Charge
To : Commanding Officer

Subj: Diving Operations Involving Explosives at
Fallbrook Annex; request for

1. It is requested that the Explosive Ordnance Disposal Officer conduct diving operations in the Main lake and West lake at Fallbrook Annex to salvage explosives from the lakes. Fallbrook Annex personnel can provide exact locations.

2. Civilian Ordnancemen at Fallbrook Annex state that the following types of ammunition are known to have been dumped in these two lakes during World War II:

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3. Salvage of the above ammunition is recommended now to prevent possible future casualties in the event repairs to dams or other construction work is required in the vicinity of the lakes. (An auxiliary fire-fighting water main is installed on a wooden pier at the location of dumped explosives in the Main lake.)

Very respectfully,

M. C. SLEDGE

Copy to:
Ord Off (Seal Beach)
Asst Ord Off (Fallbrook Annex)

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REPLY TO LTR. ON ROUTE SHEET NO.		

1633/HAH:lr
4 MAR 1976

FIRST ENDORSEMENT on CODE 30 MEMO F3241:DB of 24 FEB 76

From: 16
To: 04
Via: (1) F *il 3/9*
(2) F290 *3/9*

Subj: Explosives Test Site Approval; request for

1. It is recommended that Code 30's request for an interim explosive test site be approved.

G. G. Takach
G. G. TAKACH
Acting

Copy to:
30

FROM: Code 04
TO: Code 30

19 Nov 1976
#271-04:TCT:dws
11000

SUBJ: Code 30 memo F3241:DB:bhg dtd 24 Feb 1976 subject as above

1. Subject memo was never received by Code 04 and consequently no approval/disapproval given.
2. During telephone conversation on 18 Nov 1976 with Mr. Don Brown of Code F3241, he requested an answer to subject memo and provided a copy of this memo to Code 04. Code 04 approves this test site for the items listed. In addition to the requirements indicated in paragraph 5 of subject memo, compatibility of explosive items under test must be properly maintained. Any questions regarding compatibility of items being processed in Bldg. 368 should be discussed with Code 04 prior to the processing of these items.

Theodore C. Thorpe
THEODORE C. THORPE

Copy to:
16
F3241 ✓

Memorandum

F3241:DB:bhg
DATE: 24 February 1976

FROM 30

TO 04

Via (1) 16
(2) F
(3) F290

Subj Explosives Test Site Approval; request for,

Ref (a) Meeting between 04 and F3241/F322 on 24 Feb 1976

1. During reference (a) discussions were held relative to the facility requirements for explosives testing by members of F3241, at the Fallbrook Annex.
2. It was determined that, although there is a requirement for a permanent test facility, an interim test capability is necessary to meet existing needs while long range plans are being developed to provide more desirable facilities.
3. Accordingly, it is requested that authority be granted to utilize the building 368 complex to perform the following type tests utilizing approved Quality Evaluation Procedures and authorized test equipment:

FUNCTIONAL TESTING OF

<u>ITEM</u>	<u>AVG WT(LBS)</u>
Delay Plunger Assemblies	0.0055
Delays	0.0055
Increments f/81MM Mortar	0.0874
Primers, Percussion	0.0514
Ignition Cartridges	0.0210
Detonator	0.0030
Squibs, Electric	0.0002
Firing Device	0.0025

<u>ITEM</u>	<u>AVG WT (LBS)</u>
Detonating Cord (foot)	0.0078
Blasting Caps	0.0029
Safety Fuze	0.0026
PD Fuzes	0.0703
M48	
M51	
M52	
M57	
M82	
M519	
M521	
M524	
M526	
M527	
M557	
M716	
M717	
M719	
MT/MTSQ Fuzes	0.0017
M548	
M563	
M571	
M592	
M711	
M500	
M501	
M520	
M564	
M565	
Time Fuze	0.0093
M65	
M84	
BD Fuze	0.0202
M62	
M91	
M404	

ITEM
Proximity Fuze

AVG WT (LBS)

0.0580

M522
M513
M514
M728

Visual Inspection/Non destruct test of types
of ammunition and explosives:

All except nuclear and poison gas.

Note: Occasionally Building 364 may be utilized for
visual inspection, segregation, and related func-
tions.

4. Functional testing of projectiles such as illuminating, smoke, etc.,
will be conducted in the vicinity of the Rockeye drop test site or when
required, at Camp Pendleton.

5. Quantity and weight of explosives material will be kept to a minimum
consistent with a day's operation, except that, the quantity in the test
cell shall be a single unit. Fuel/Air Explosives and other liquid type
weapons will not be processed in the buildings simultaneously with solid
type explosives.

6. Construction of a test cell (12" reinforced concrete) will be accom-
plished to provide a facility for the disassembly of artillery and mortar
ammunition and associated components and in addition will be utilized sep-
arately for Rockeye operations. Cell explosive limit is 15 pounds.

7. Test vans, power and air van, and crew change facility will be located
in the 368 complex to provide additional facilities for WQEC testing. The
crew change facility will be a designated smoking area (equipped to meet
safety requirements) and will also serve as a lunch area. Keyport magazines
will be located 100 feet to the rear of the test cell.



Copy to:

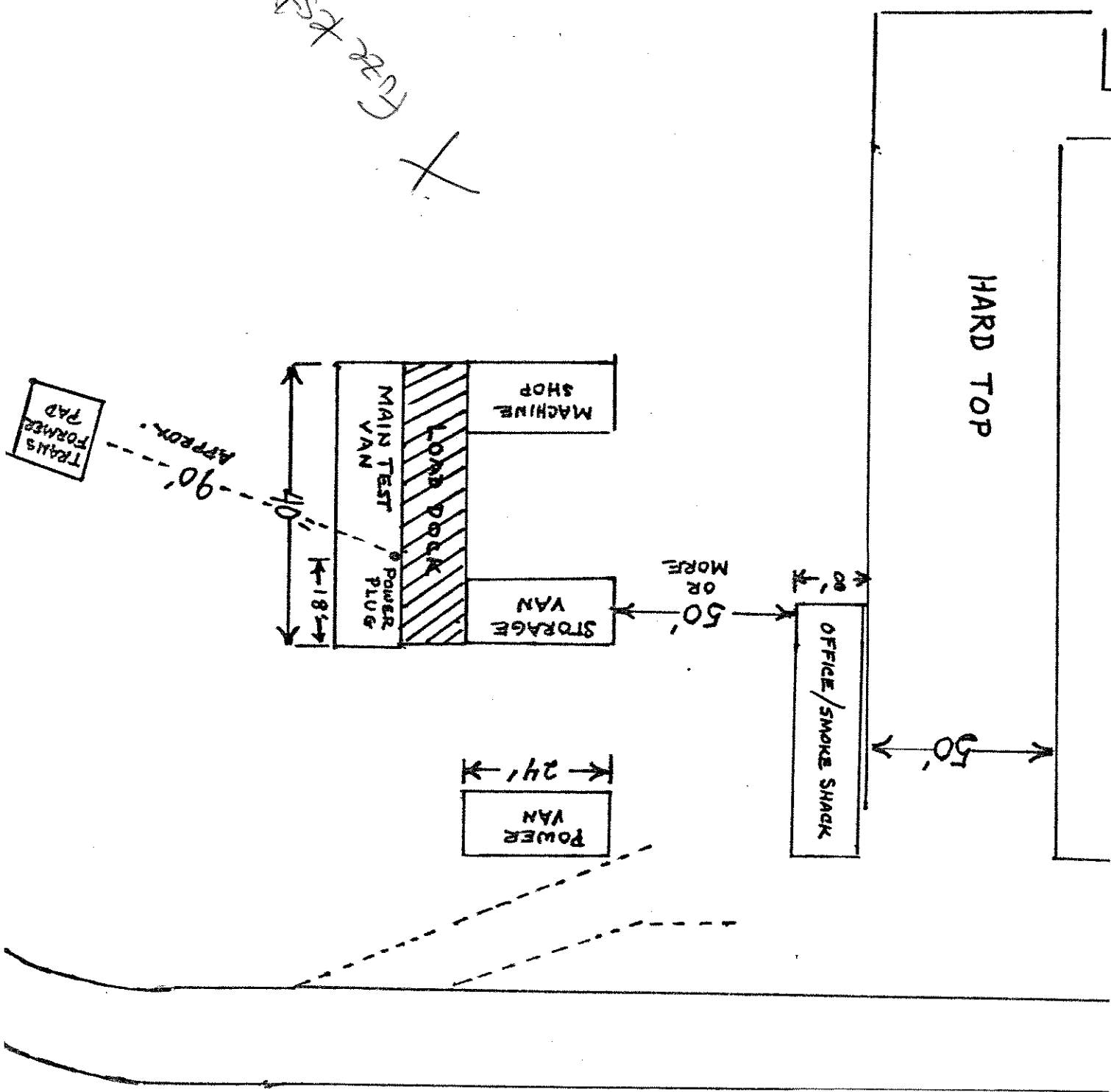
F324

F3241

F322

301

check test
railroad test
shaft into





DEPARTMENT OF THE NAVY
BUREAU OF ORDNANCE
WASHINGTON 25, D. C.

IN REPLY REFER TO
.Ma3c-5 SJB:jc
NT1-20

10 JUL 1952

From: Chief, Bureau of Ordnance

To: Commanding Officer
U. S. Naval Ammunition Depot
Fall Brook, California

Subj: Approval of ammunition disposal area

Ref: (a) NAD Fall Brook spdltr L8-5/1(2032)(3/1):ad of 16 June 1952
(b) Ordnance Pamphlet 5, Chapter 8 *Ord*
(c) NAVORD OCL A3-50 *OCL*

1. Reference (a) requested approval of the ammunition disposal area indicated therein, for the destruction of obsolete or other unserviceable ammunition by burning or detonation.

2. The subject site indicated in enclosure (1) and as described in reference (a) is considered to be satisfactory to the Bureau of Ordnance for the accomplishment of destruction of ammunition either by burning or detonation.

3. The maximum limits of the various types of explosives to be destroyed and the methods employed in the destruction of explosives are outlined in references (b) and (c).

See 3578 dtd 12/10/52.
See 243 dtd 2/25/54. u. Clute.

M. F. SCHOEFFEL

J. M. CLUTE
By direction

Request copy for Inspection Manual.

K

SR

7/13
3926

Memorandum

DATE: 07 Jan 85

FROM: F

TO: Distribution

SUBJ: CLOSING OF THE MARINE BARRACKS, FALLBROOK

1. The Commandant of the Marine Corps has announced his intention to close Marine Barracks, Fallbrook, in calendar year 1987. It is anticipated that civilian DoD guards will replace the Marine Security Force at that time.

2. A meeting will be held in the Conference Room, Building 1, at 0900, 30 January 1985, to discuss ways and means to facilitate the conversion.


R. G. BULKLEY

Distribution:

F013

F07

F097

F150

F290

Copy to:

10



NAVAL WEAPONS STATION
SEAL BEACH, CALIFORNIA 90740

IN REPLY REFER TO:
IM/5750-1/bba
Ser 206
30 JAN 1968

From: Commanding Officer, U. S. Naval Weapons Station,
Seal Beach, California 90740
To : Chief of Naval Operations (OP-09B9)
Washington, D. C. 20350
Subj: Command History, U. S. Naval Weapons Station, Seal
Beach for 1967 (OPNAV REPORT 5750-1); submission of
Ref : (a) OPNAVINST 5750.12
Encl: (1) Command History, WPNSTA Seal Beach, year ending
31 December 1967.
1. Enclosure (1) is forwarded in compliance with reference
(a).


E. H. SIMPSON

Copy to:
COMNAVBASE LOSA

Post 1946 Command File
Share Est.
NHG-OPA

OPNAV REPORT 5750-1
COMMAND HISTORY

U. S. NAVAL WEAPONS STATION
SEAL BEACH, CALIFORNIA

YEAR 1967

I - CHRONOLOGY OF EVENTS

- 10 Jan Comprehensive Command Inspection conducted at Seal Beach by the Commander COMNAVBASE LOSA.
- 11 Jan Comprehensive Command Inspection conducted at the Fallbrook Annex by the Commander COMNAVBASE LOSA.
- 17 Jan The Mexican Ship PORIFRIO LOPEZ TOLEDO, commanded by Capitan DE FRAGATA, visited the Station.
- 19 Jan An Explosive Safety Inspection was conducted at the Station and Annex by the Armed Services Safety Board.
- 25 Jan Rear Admiral E. P. IRONS, NAVMED Chief Inspector, conducted an inspection of our medical facilities.
- 30 Jan Mr. CHARLES ROSE, NAVAIRSYSCOMREPAC Chief Inspector, conducted a Quality Evaluation Comprehensive Inspection.
- 6 Feb A Navy Technical Proficiency Inspection was conducted at the Station.
- 13 Feb A Navy Technical Proficiency Inspection was conducted at the Fallbrook Annex.
- 20 Feb An Explosive Safety Survey was conducted by representatives of NAVAIRSYSCOMREPAC and NAVORD.
- 27 Feb A Surface Missile Proficiency Re-inspection was conducted by a team from NSMSES.
- 27 Feb The Marine Barracks underwent its annual I. G. Inspection conducted by a team under Colonel J. D. ROSS, USMC.
- 8 Mar A Seminar was conducted to discuss our real estate problems. Among the attendees were Mr. W. H. POINT, OSD; Captain W. W. GENTRY, Office of CNO; Captain J. M. HILL, Office of Assistant Secretary of the Navy (I&L); CDR K. P. SEARS, NAVFAC.
- 14 Mar Mr. FREDERICK STERNS, Office of Assistant Secretary of Navy (I&L) visited to discuss certain aspects of our real estate problems that arose as a result of the Seminar on 8 March.
- 17 Mar Captain WRIGHT, Office of CNO, discussed implementation of the 3M System during his visit.

- 28 Mar A SMACS Seminar was conducted by LCDR M. A. LEAL, NAVORD, and LCDR E. W. ACHORD, NWS Yorktown. Representatives from NAD Crane, FMSAEG Corona, NAD Hawthorne, SPCC Mechanicsburg, NWS Concord, and NAVSUP were among those attending.
- 3 Apr A Canadian Team headed by LCDR NEWSTEAD, Royal Canadian Navy, visited to discuss the ASROC Program.
- 13 Apr The Station was visited by the following foreign visitors to discuss personnel matters: J. GORKHALI, NEPAL; M. MALIK, NEPAL; A. MEMOM, PAKISTAN; A. ZUBI, JORDAN.
- 24 Apr The first Martin WALLEYE was built and passed its acceptance test at the Fallbrook Annex.
- 25 Apr The following German Nationals visited the Station to discuss the ASROC Program: LCDR H. K. MAYER; LT H. J. FELLNER; and Mr. K. WOLF.
- 1 May A meeting to discuss mutual real estate problems was held and chaired by Rear Admiral WOODING, Southwest Division of NAVFAC. Other Offices and Commands represented were Orange County Board of Supervisors; Orange County Real Estate Board; County Harbor District; Army Corps of Engineers; and Naval Station Long Beach.
- 8 May Mr. K. N. CROWELL, NAVAIR, visited to discuss the assembly of the air-launched missiles.
- 18 May Bids for construction of an All-up Missile Facility at Fallbrook Annex were opened. The Foster Construction Company, Anaheim, California was low bidder at \$1,228,030.
- 24 May A World Wide Surveillance for Mines (QEL) Conference conducted with representatives from NWS Yorktown, NAD Oahu, and NAVAIR in attendance.
- 8 Jun Representatives from NAVORD visited the Station to review and appraise all aspects of ADP resources dealing with installation of our new computer and to discuss missile problems.
- 23 Jun Rear Admiral H. V. BIRD, USN, Los Angeles Naval Station, toured the Station.
- 26 Jun CDR LOUIS MAYOR and five other officers of the French Navy received an indoctrination tour of the Station.
- 30 Jun LCDR T. A. DADSWELL, Royal Australian Navy and Liaison Officer for the visit of HMAS MELBOURNE arrived to assume those duties.

- 30 Jun Representatives of the Southwest Division of NAVFAC inspected the Fallbrook Annex facilities.
- 13 Jul The Mexican Minesweeper, DM-20, under the Command of LCDR F. R. GODINEZ, picked up materials purchased by the Mexican Government.
- 15 Jul The Station was converted from the Modified Industrial Accounting System to the Navy Industrial Fund Accounting System.
- 17 Jul A Defense Integrated Management Engineering System (DIMES) conference was held. It was chaired by Mr. LEE HARDING, Office of the Secretary of Defense (I&L).
- 28 Jul The following Royal Australian Navy Officers discussed the upcoming visit of HMAS MELBOURNE: Captain J. P. STEVENSON, LCDR DADSWELL, and LT D. L. GRAICHEN.
- 31 Jul Mr. J. S. CRUPI, Assistant Secretary of the Navy (I&L) and Mr. F. STANLEY, NAVORD, visited to discuss our ordnance production.
- 9 Aug Mr. M. MORTON, NAVORD, was chairman of a Surface Launched Missile Logistics Operations Meeting. Other Commands represented were: NWS Yorktown, NAVSUP, and NSMSES.
- 18 Aug Mr. H. M. ROYLANCE, NAVORD, visited the Station to discuss explosive safety.
- 5 Sep A series of classes was initiated on the STANDARD ARM at the Fallbrook Annex. Classes were attended by Civil Service, Air Force and Contractor personnel.
- 7 Sep Vice Admiral RUSSEL and party visited the Fallbrook Annex in conjunction with their investigation to determine means to reduce explosive hazards and fires aboard ships.
- 7 Sep An Explosive Safety Survey was conducted at the Fallbrook Annex by NOSSOPAC representatives.
- 13 Sep The 11th Naval District Fire Marshal conducted his annual inspection of the Fallbrook Annex.
- 19 Sep A missile Defect Inspection was conducted at the Fallbrook Annex by representatives of NAVAIR Rework Facility, Alameda.

- 20 Sep The Orange County Planning Commission was given a briefing by the Commanding Officer and toured the Station
- 27 Sep The first STANDARD ARM was built and accepted at the Fallbrook Annex.
- 28 Sep Captain GAULT and CDR RYDER from Office of the Assistant Secretary of the Navy (I&L) were briefed on the small boat problem in Anaheim Bay
- 4 Oct The Station was awarded the Minute Man Flag for its savings bond participation. This flag represented the fifteenth year of recognition.
- 19 Oct HMAS MELBOURNE under the Command of Captain A. M. SYNOTT, RAN, arrived for a four day visit.
- 23 Oct The Manpower Validation Survey Team under the direction of LCDR R. B. HOWARD arrived to conduct its survey.
- 6 Nov CDR A. M. SINCLAIR, NAVORD, conducted a SUBROC Inspection on the Station.
- 7 Nov Commanders DUNNEL, NAVFAC, and TAYLOR, OPNAV, and Mr. A. FRANK, Associate Counsel (Real Estate), NAVFAC, discussed the Anaheim Bay small boat problems.
- 7 Nov A NIF Training Course was conducted by LT SHERMAN, NSMSES, for Department Heads and interested Division Supervisors.
- 27 Nov A Quality Assurance Audit was conducted by Mr. J. D. LAVEN, Audit Chairman, FMSAEG.
- 28 Nov A Surface Missile Proficiency Inspection was conducted by a team lead by LCDR O'NEILL, Chief Inspector, NSMSES.
- 28 Nov Rear Admiral GRALLA, Commander NAVORD, visited the Station. He was briefed by the Commanding Officer and toured the Station.
- 1 Dec The Fallbrook Annex telephone plant account and maintenance responsibilities were transferred to the Marine Corps Base, Camp Pendleton.
- 6 Dec Messrs McKEEN, WELLER and WHITNER conducted a presentation of the plans and programs of WPEC, Crane.
- 7 Dec The Military Affairs Committee, Orange County Chamber of Commerce, was conducted on a special tour to update the members on the more advanced functions of the Station in order to permit them to evaluate our services to the combatant forces of the Navy and Marine Corps.

7. Reorganization

a. The function of preparing and issuing the Guided Missile, Torpedo and "EYE" Family Quality Assurance Provisions (QAP's) was transferred from the QA Department to Quality Evaluation Laboratory.

b. A Reliability Branch, Weapons Quality Engineering Division, QEL was established to provide a strong technical operation for the SUBROC final acceptance function and for developing reliability and in-house oriented repair, overhaul and rework programs for the SUBROC Weapon.

c. The sections of the Engineering Branch, QEL, were eliminated to shorten the span of control.

d. The Metrology Section was raised to Branch status in the Weapons QE Division to improve the function status to obtain greater indirect support from NAVORD for handling the increased workload.

e. The Automated Data Processing Division was divorced from the Comptroller Department and elevated to departmental status. This was due to the increased number of new systems introduced, widening of station support services and receipt of new and more sophisticated equipment.

f. Supply Department created two additional Branches i.e., Delivery Branch to deliver supplies and material to end users; and a Key Punch Branch, required due to the implementation of the computerized Supply Inventory Management Control System.

g. The Guided Missile Branch, QE Division, QEL was split into two separate branches; Air Launched and Surface Launched. This was necessary as the build-up in the missile area became too complicated for one person to properly supervise all areas of responsibility.

III - OPERATIONS OR ACTIVITIES

A. Organization Highlights

1. The Station was converted to a NIF Activity by charter dated 5 June. The Charter authorized the Station to finance its operation under NIF and allocated \$800,000 for the initial working capital.
2. The Supply Department planned and implemented a computerized Supply Inventory Management Control System. Supply utilized the services of the Federal Prison Industry, Terminal Island, for the key punching and verifying of approximately 140,000 cards required to convert Supply and Ordnance stock records to computer operations. Supply prepared manual records and recorded source data for key punching approximately 16,000 stock records.
3. The Quality Assurance Department continued to expand as evidenced by:
 - a. The Department received its first test set acceptance task when it was made responsible for final government acceptance of the first DSM-75 for use on STANDARD MISSILES.
 - b. Departmental personnel at the Annex received its first task in the Depot Acceptance Program (DAP) when it was assigned responsibility for performing final government acceptance on STANDARD ARM.

c. The Quality Management Division improved the station's overall quality effectiveness by implementing a program for measuring and evaluating quality effectiveness through a system of collecting, analyzing and weighing quality data.

4. Besides their routine duties, personnel of the Security Department were kept occupied with a diversity of events, such as:

a. Hosting twenty-four Boy Scout Camp-outs on the Station beach.

b. Discovering and reporting twenty Station perimeter vehicle accidents to local law enforcement agencies.

c. Rescuing ten civilian small craft in distress in Anaheim Bay.

d. Reporting to the Huntington Beach Harbor Patrol twelve craft in distress in their area of jurisdiction.

e. Sighted and reported five distress signals off shore to the Coast Guard.

f. Provided a landing site for a police helicopter equipped with tear gas during a "Hippie Love-in" on the City of Seal Beach beach and involving approximately 5,000 "Hippies" and the same number of onlookers.

5. LCDR J. F. TURPEL assumed the duties of Weapons Officer on 1 May. The workload of the Ordnance Department continued to increase at a rapid rate:

a. Production of Conventional Ammunition

(1) Renovation of gun ammunition has continued

at a normal rate with the exception that the number of rounds per lot is getting smaller and thus increases the actual workload two-fold.

(2) The Mainsite has been given the mission of assembling 5"/54 cartridges. This mission requires the renovation of cartridge tanks in conjunction with the assembly process. Of the 122 increase count in personnel at the Mainsite, 70 spaces are employed in these functions.

b. Production of Air Launched Missiles

(1) One new air launched missile was introduced into the Annex. The (STANDARD ARM).

(2) Renovation of Missile Containers was introduced into the Annex workload on a limited scale.

c. Production of SMS Missiles

(1) The Standard Missile was introduced into the SMS workload. A pilot line was established and 24 STANDARD Missiles were assembled and tested satisfactorily.

(2) The DSM-75 Test set, required to test STANDARD Missiles, was installed in Building GM-4A. As of 31 December this test set was not given final acceptance by the Navy. Both Ordnance and QA personnel are receiving training on this test set in conjunction with Guided Missile personnel.

(3) NWS SB has now been designated by NOSC as a surface missile handling equipment overhaul point.

(4) Total SMS Missiles tested:

TERRIER	1167
TARTAR	594
TALOS	270
STANDARD	24

d. Production of ASW & SW

(1) Productive effort in ASW and Special Weapons proceeded in a normal manner.

(2) One new ASW weapon, the MK 46 was introduced. Preliminary work was accomplished and productive effort is scheduled for 1968.

(3) Total ASW weapons produced:

ASROC (All types)	430
MK 44 Torpedoes	351
MK 47 Torpedoes	95

e. RSS&I Activities

(1) The receipt, stowage, segregation and issue of both conventional and non-conventional ammunition continued its increased activity during 1967.

(2) The number of ships now being serviced by this Station has increased to 305 individual ships, the number of ships equipped with missile launch systems has increased from 32 to 53.

(3) Four Aircraft Carriers including HMS MELBOURNE were outloaded at the wharf.

(4) Calendar year 1967 RSS&I activity:

	MISSILES Tons	CONVENTIONAL Tons	TOTAL Tons
Offload	4742	12,372	17,114
Onload	5293	20,504	25,797
Receipt for others	7760	46,904	54,664
Issue to others	6610	33,557	40,167
Segregate		11,248	11,248
Restow	1856	6,708	8,564
Total	26261	131,293	157,554

(5) Number of Ships serviced:

Offload	293
Onload	432

(6) All fleet returned material is now being 100% inspected during the segregation process.

f. During 1967 the Ordnance Department started the 1st phase of Mechanized Reporting. (EDP) Procedures for the conversion of manual inventory accounting to EDP and the keypunching of conventional ammunition records have been completed.

g. Tonnage moved at Fallbrook Annex continued to increase; 17% over 1966. 23,359 tons of material were shipped while 34,000 tons were received, for a total of 57,357 tons for the year.

h. 1,454 commercial trucks brought material to the Annex while 1,782 trucks were used for outgoing shipments.

i. 557 railroad cars were received at the Annex while only 44 carloads were shipped, reflecting the greater flexibility and quicker response of trucks meeting the needs to move priority outgoing munitions demand. Conveyance usage was increased 22% over 1966.

6. The Quality Evaluation Laboratory continued to increase its scope and responsibilities. Most noteworthy events were:

a. The WALLEYE surveillance tests capabilities, equivalent to performing factory acceptance, were established.

b. NWS Seal Beach QEL was designated as the coordinator of the STANDARD Missile G&C surveillance functions.

c. The QEL established failure diagnosis capabilities on the SHRIKE computer.

d. Maintenance responsibilities for the AN/DSM-75 STANDARD Missile Test Set were delegated to this laboratory.

e. Calibration functions were established at the Fallbrook Annex.

f. A QEL representative position was established at the Annex.

IV - SPECIAL TOPICS

A. Construction and Facilities

1. Construction on the Assembled Air Launched Weapons Facility (All-up) commenced in May. This project is now 67% complete.


2. The Special Weapons Magazines are now 85% complete. Only the TALOS magazine remains to be completed.

3. The addition to Building AO-22 (ASW Facility) is 99% complete, with only the emergency generator remaining to be installed.

4. The contract to raise the Anaheim Bay bridge was awarded on 29 August. Work is now 99% complete and the channel is now open to larger boats.

5. Extensive modifications were completed to Building SB-5 for occupancy by Goodyear Aero Space to conduct SUBROC testing.

B. Agreements

1. Navy - NASA joint venture for construction of an 
Ammunition Disposal Facility and Pneumostatic Test Facility
was started and completed.

2. The land-use license with NASA expired on 1 July
1967.

D. Community Relations

1. This Command participated with Orange County Officials in discussions on mutual problems.

a. Anaheim Bay Small Boat Traffic

b. Anaheim Bay Bridge

c. Real Estate

2. The Commanding Officer has been appointed a member of the Executive Committee, West Orange County United Funds. This Station contributed \$14,002 for an average of \$13.17 per person to this fund.

3. The Station's float entry won first place in its class in the Huntington Beach Fourth of July Parade.

4. The Marine Barracks, NWS Seal Beach, participated in many civic events, including furnishing color guards for three major events.

5. The Marine Barracks, Fallbrook Annex, sponsored the Marine Corps Birthday Ball. Participation was over 200 persons, many of the local officials and their wives.

Officer L. Charles
Weapons Station
Fallbrook, Calif.

P.O. Box 363
Fallbrook, Cal.

February 19, 1969

Dear Sir:

You are in the profession of training men. In my own way I hope that I am being instrumental in training youngsters to also become men.

Regarding the latter, I am seeking your help.

I am president of a newly-formed club, the Fallbrook Junior Rifle Club. At the present time there are about 25 members and the enrollment is steadily increasing.

We have received our charter and are affiliated with the National Rifle Association, an organization with which we are all familiar.

As you know, the purpose of this club is to instruct members in the safe, sane and accurate use of firearms. This valuable instruction is obvious to you.

We are sorely in need of a firing range for the boys. It is my sincere hope that you might find it feasible to use a range at the Weapons Station, on weekends.

I can assure you of sufficient adult supervision as we have allotted one adult overseer for each boy. I can also guarantee that the firing area would be left in "ship shape", after each firing session by our members. This too, is a vital part of their training.

This request is made on behalf of the area young people who want to make intelligent use of firearms. I realize that you receive many requests in the course of your duty and sincerely hope that this one will merit your consideration.

Respectfully yours,



Lewis Reed,
Pres. Fallbrook Junior Rifle Club

IN REPLYING
REFER TO NO.

NAVAL AMMUNITION DEPOT
FALLBROOK, CALIFORNIA

February 2, 1942.

From: The Acting Inspector of Ordnance in Charge.
To: The Secretary of the Navy, Washington, D. C.

Info. Buord
Bunav
Comeleven
ComSanPedro

In accordance with instructions received January 31, ~~Naval~~ NAD
~~transmission Deputy~~ Fall Brook California placed in commission
1000 this date.

CC to
Communications, 11th Naval Dist.



DEPARTMENT OF THE NAVY

NAVAL SEA SYSTEMS COMMAND

WASHINGTON, DC 20362-5101

IN REPLY REFER TO

8020

Ser 06H11/1067

31 11 1985

From: Commander, Naval Sea Systems Command
To: Commanding Officer, Naval Weapons Station
Seal Beach, California 90740-5000

Subj: REQUEST FOR BURNING SITE APPROVAL

Ref: (a) NAVWPNSTA Seal Beach ltr 8000 Ser 04/2936 of 2 Dec 1985
(b) NAVSEA OP-5 Volume 1 (Fourth Revision)

1. The request of reference (a) has been reviewed with respect to and meets the criteria of reference (b). The burn site and procedures for burning residual propellant, presented in enclosure (2) to reference (a), are approved.

Copy to:
NAVSEACENPAC

A. E. Chandler
By [Signature]

* - See before mailing.
0 - See after mailing.

8000
581.

CODE

INITIALS
AND DATE

2 DEC 1985

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F. T. 11/26

20 LDR 11/26

34 CH 11/26

CH 11/26

NWSSB 04

CH 11/26

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From: Commanding Officer Naval Weapons Station Seal Beach
To: Commander Naval Sea Systems Command (SEA 06H)

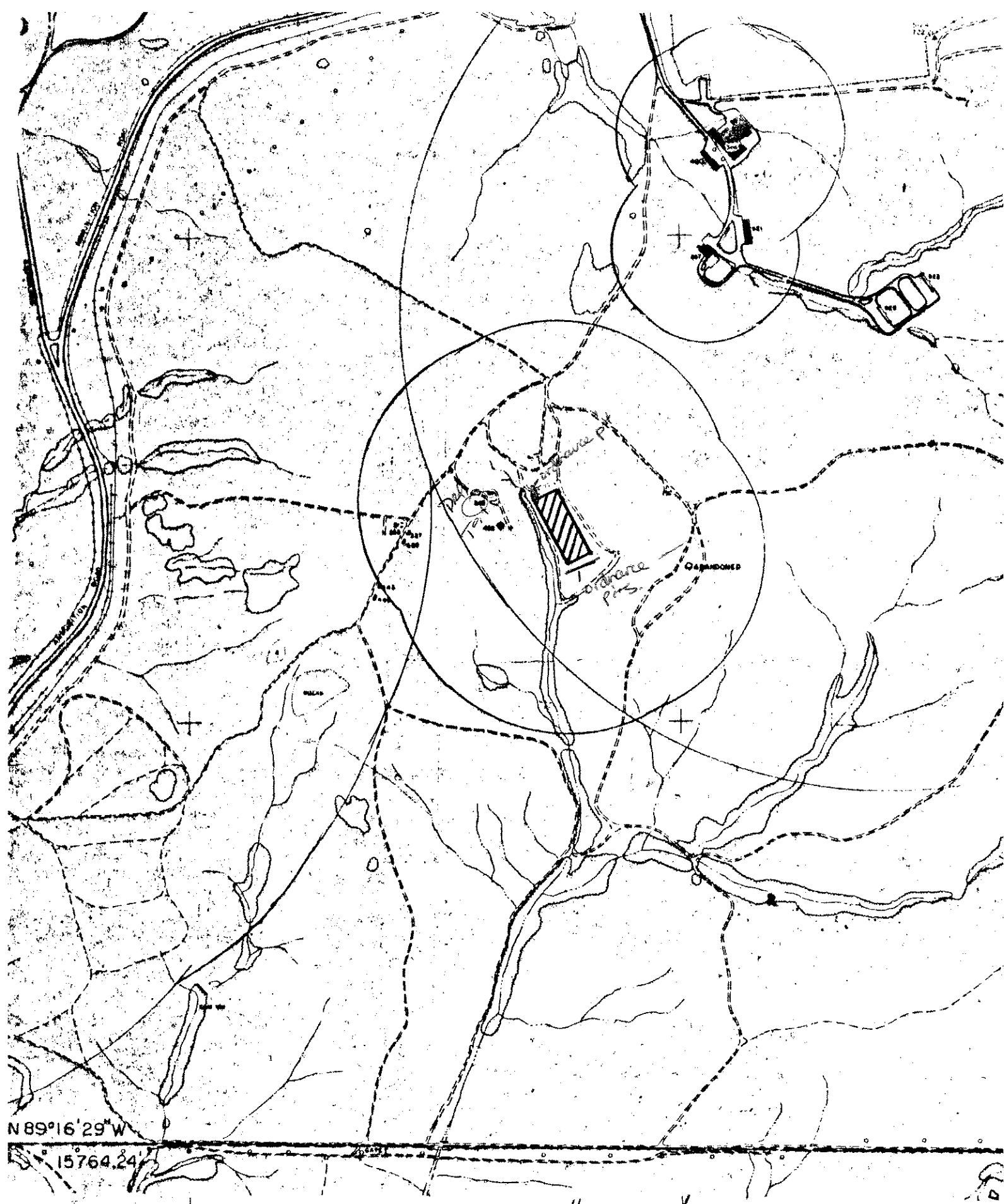
Subj: BURNING SITE APPROVAL; REQUEST FOR

Ref: (a) NAVSEA OP 5 Vol 1, 4th Rev.
(b) Telcon A. Chandler NAVSEASYS COM 06H and P. Rodriguez of 13 August 1985

Encl: (1) SB/QEP 8090-958 General Purpose Smokeless Powder Disposal
(2) General Development Map 6116780 Fallbrook Site

1. During reliability testing of various types of Marine Corps propellants, small quantities of residue propellants are generated and must be disposed of by burning. It is desired to burn the residue at the Fallbrook site on ground within the test firing area.
2. IAW reference (a) disposal of ammunition by burning shall be accomplished in an area approved by NAVSEASYS COM.
3. As requested by reference (b), enclosure (1) includes pertinent general and specific safety requirements of reference (a), and enclosure (2) is annotated with the disposal site and explosive safety arcs.
4. Operations will be conducted by certified personnel of the Marine Corps Program Branch of the NAVSEA Programs Division NWSSB Fallbrook site.
5. Request approval of site and procedure to burn residual propellant.

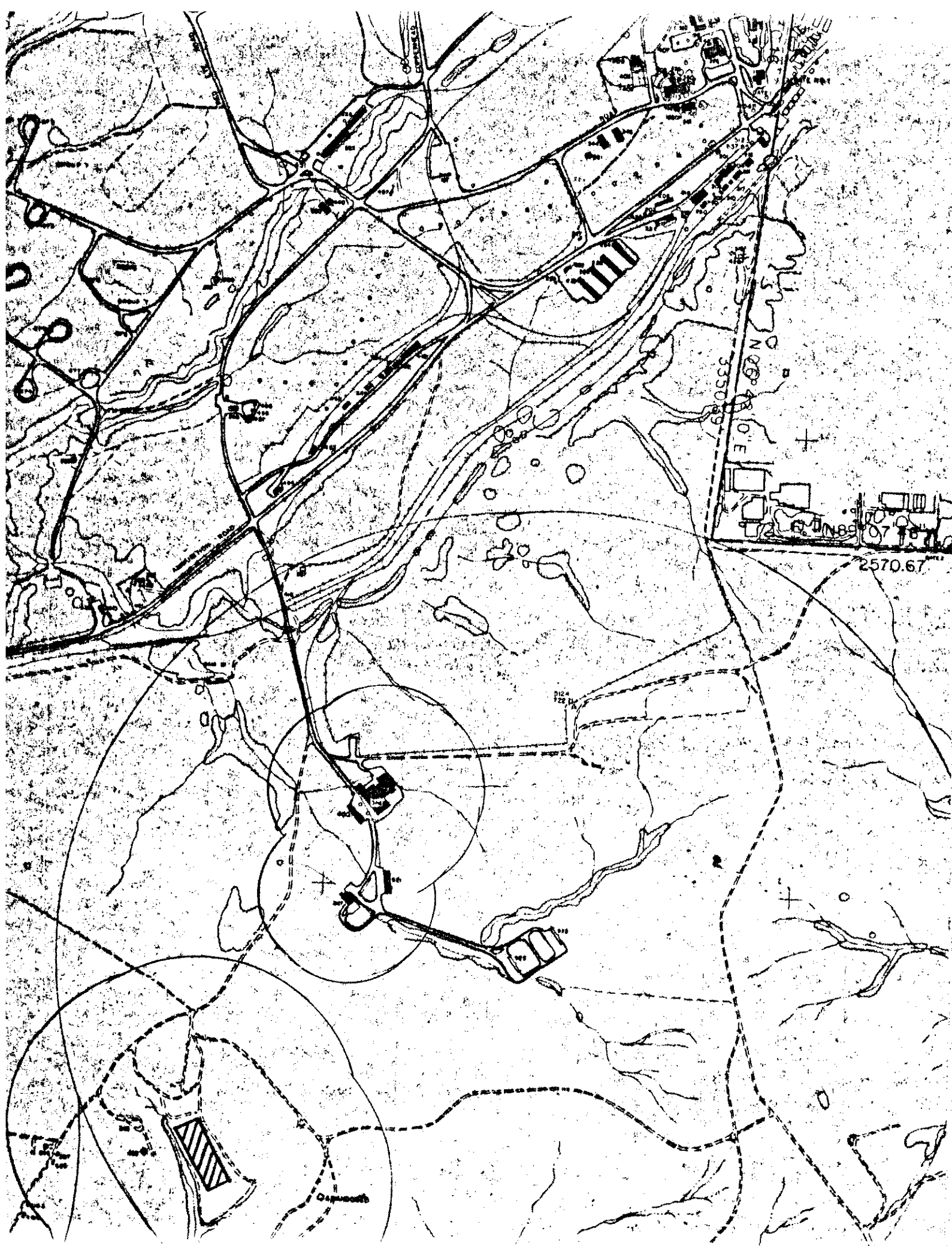
S. C. KOZLOWSKI



N 89° 16' 29" W

15764.24

1" = 1000'



Memorandum

DATE: 28 April 1977

FROM: F323

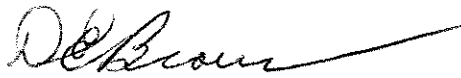
TO: 301
Via: (1) F322 *4/25/77*
(2) 32 *4/28 OK*
SUBJ: Revaluation of Additional Keyport Magazines
Ref: (a) Meeting between 301 and F323 31 Mar 77
(b) Code 30 memo 301:JB of 14 Oct 76

Encl: (1) Sketch for Location of Keyport Magazines behind Bldg. 368 - FBA
(2) Keyport Magazine Location at Bldg. 364
(3) Copy of NAVORD HQ 1221 Plan for WQEC Test Facility Area

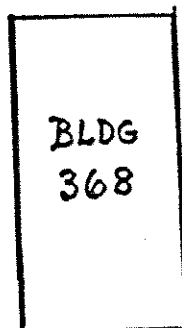
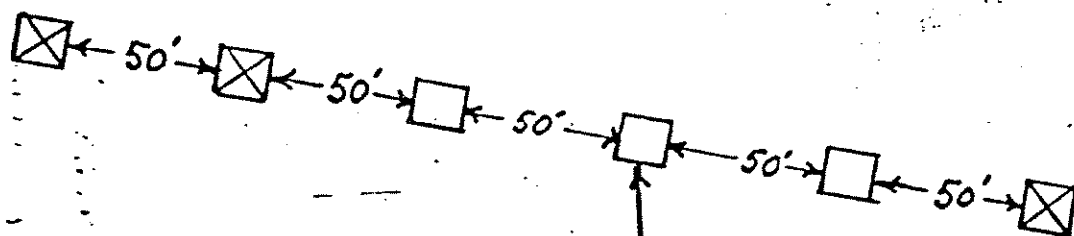
1. During reference (a), it was requested that a review of Keyport magazine requirements be conducted to determine current requirements.
2. Due to change in planned usage of facilities and the availability of other spaces, it has been determined that the additional Keyport magazine requirement at the Fallbrook Annex is as follows:

<u>Location</u>	<u>Qty</u>
368	3
364	4 (due to building sharing)
(Drop test area)	1

3. Enclosure (1) depicts Keyport location at Bldg. 368, enclosure (2) depicts location at Bldg. 364, and enclosure (3) depicts location at Drop Test area.
4. In the event that the complete WQEC Test Facility is constructed at the Drop Test area, Keyport magazines available at that time would be relocated as required.


D. E. BROWN

Copy to: *w/o ENCL.*
F
F3233
F290
F297



EXISTING LOCATION
OF 3 KEYPORT
MAGAZINES
(MAX 100# CLASS
7 EXPLOSIVES EACH

FIRE
ALARM BOX

TO NOBLE AVE
TWO TENTHS MILE →

SKETCH FOR LOCATION OF KEYPORT
MAGAZINES BEHIND BLDG 368 - FBA

☒ PROPOSED LOCATION OF AN ADDITIONAL 3 MAGAZINES

Enclosure (1)

Chery
B:lx
Ser: 72
16 April 1969

Officer in Charge

CO, Marine Barracks

Use of target range by NRA Group

ENCL: (1) LTR from Mr. Reed

1. If it is feasible for this group to use our range, it looks like the type of public support we should provide.
2. Properly executed waivers by parents of the youths involved would be a necessary requirement to protect the Government's interest.

R. S. FOGG

ADDRESS REPLY TO
BUREAU OF ORDNANCE, NAVY DEPARTMENT

AND REFER TO

NAVY DEPARTMENT
BUREAU OF ORDNANCE
WASHINGTON 25, D. C.

S78-2(27)
(Ma3a-2)GGM:gs



RESTRICTED

From: Chief of the Bureau of Ordnance

To: Commanding Officer
U. S. Naval Ammunition Depot
Fall Brook, California

13 SEP 1949

Subj: Ammonium Nitrate Cratering Charges, Disposition of.

Refs: (a) NAD, Fall Brook ltr. NT1-20/S78-1 DAL:lg Serial
600 dtd. 25 August 1949.
(b) PR&D Regulation, No. 1 (15 April 1949, Rev.) Art
117.1.
(c) ALNAVSTA 12, dtd. 12 May 1948.
(d) OP5, Art. 1408.

1. Reference (a) reported sixty seven (67) of the subject charges as being unserviceable through deterioration of the metal charge container, and requested disposition of the charges.

2. The unserviceable charges should be surveyed, and under the authority contained in references (b) and (c), disposed of by burning in the approved burning area in accordance with the provisions of reference (d). One copy only of the survey should be forwarded to this Bureau.

3. In preparation for the above operation, the explosive material should be removed from the deteriorated metal containers, insofar as practicable, utilizing spark proof tools, and spread, together with ruptured containers, over sufficient combustible material such as kindling and scrap lumber, to insure complete destruction by burning. Due to the corrosive action of ammonium nitrate on metallic alloys containing copper, the tools used should be thoroughly cleaned upon completion of the work. Although there is only a remote possibility of the material detonating during burning, the safety precautions contained in reference (d) shall be observed, and an ignition train provided sufficiently long to assure that personnel will reach a place of safety before the explosive material is involved in the fire.

4. These same disposition instructions shall be observed by information addressees in the event similarly deteriorated charges are on hand.

cc:
USS Burton Island (AGB-1)
Munitions Officer, Marine Corps School,
Quantico, Va.
DQM (Ord) MCSD, Camp J.H. Pendleton,
Oceanside, Calif.
NA/ND, Seal Beach, Calif.
Naval Powder Factory (ECODU), Indian Hd., Md.
083149 0333

A. G. NOBLE

WBM

RESTRICTED

ADDRESS REPLY TO

RESTRICTED



Commanding Officer

NAVAL AMMUNITION DEPOT
FALL BROOK, CALIFORNIA
AND REFER TO

NAI-20/878-1

DAL:ly Serial 600

NAVAL AMMUNITION DEPOT
FALL BROOK, CALIFORNIA

25 August 1949

From: The Commanding Officer

To : Chief of the Bureau of Ordnance, Navy Department, Washington 25, D.C.

Subj: Ammonium Nitrate Cratering Charges; Deterioration of Containers.

Encl: (A) Three (3) Photographs of Cratering Charge Containers.

1. Recent shipments of subject charges to the USS Burton Island (ACP-1) and to the Naval Powder Factory, Indian Head, Maryland, have revealed that some of the containers shipped had deteriorated to the extent that they were not supporting the charge within them.

2. After receiving a report from the USS Burton Island, via NA&ND, Seal Beach, that several of the charges sent to them were badly deteriorated, this Depot notified the Naval Powder Factory of this fact and requested that an inspection be made to determine the condition of the charges issued to them. The following report was received from the Officer in Charge, Explosive Ordnance Disposal Unit & School, Naval Powder Factory, Indian Head, Maryland:

"15 - 40 lb. Ammonium Nitrate Cratering Charges shipped on AMSO 525774 were received 4 August 1949 by this activity. A thorough inspection of each cratering charge indicated considerable deterioration of the metal charge container. Such condition is considered to be unfavorable and it is considered that the Commanding Officer, NAD, Fall Brook, California concurs." Enclosure (A) was sent with the above report to this depot, and these photos are forwarded to the Bureau.

3. This depot has completed a unit for unit inspection of the 225 charges still on hand. This inspection has revealed that of the sixty-seven (67) charges found to be unserviceable, sixty-five (65) were manufactured by the E. I. DuPont De Nemours & Company, while the remaining two (2) were manufactured by the Atlas Powder Company. Disposition for these sixty-seven (67) unserviceable cratering charges is requested.

4. Copies of this letter are being sent to all activities that have received subject charges from this depot within the last year.

Encl: (HW)

CC:

USS Burton Island (ACP-1)
Ammunitions Officer, Marine Corps School, Quantico, Va.,
DQM(Ord)MCSO, Camp J. H. Pendleton, Oceanside, Calif.,
NA&ND, Seal Beach, California
Naval Powder Factory (EODU), Indian Head, Maryland

A. J. Smith

RESTRICTED

ADDRESS ALL COMMUNICATIONS TO:
COMMANDING OFFICER
AND REFER TO



ECDH
WRB:mr

U. S. NAVAL POWDER FACTORY
INDIAN HEAD, MD.

4 August 1949

From: Officer-in-Charge, U.S. Naval
Explosive Ordnance Disposal Unit & School
To: Commanding Officer
Naval Ammunition Depot
Fall Brook, California
Subject: Ammonium Nitrate Cratering Charges,
Condition Report on.
Reference: (a) NavSpdltr from CO, NAD, Fall Brook, Cal.
NPL-20/121-4 DAL:hk (Serial 50) dtd
11 July 1949.
(b) AMSO #525774.
Enclosure: (A) Photos of Cratering Chgs. upon Arrival
and Receipt by the Naval Explosive Ordnance
Disposal Unit.

1. In compliance with reference (a) the following information is herewith submitted.

15 - 40 lb. Ammonium Nitrate Cratering Charges shipped on AMSO 525774 (ref. (b)) were received 4 August 1949 by this activity. A thorough inspection of each cratering charge indicated considerable deterioration of the metal charge container. Such condition is considered to be unfavorable and it is considered that the Commanding Officer, NAD, Fall Brook, Calif. concurs.

2. Enclosure (A) indicates the extent of deterioration of the charge containers.

W. R. Brooks
W. R. BROOKS

*See Fall Brook ltr
Serial 650 dtd 8/25/49*



WAR TIME HISTORY OF THE
NAVAL AMMUNITION DEPOT
Fall Brook, California

010246 1215

MCB EOD SUPPORT / AMMO EXPENDITURE SHEET

COMMITMENT #

071-02

SCHEDULING		
DATE: 020315	START TIME: 0830	END TIME: 1045
RECEIVED BY: CWO-4 SPENCER		DATE RECEIVED: 020314
REQUESTOR INFORMATION		
RANK/NAME: JIM OLIVER	POINT OF CONTACT (OTHER THAN REQUESTOR)	
UNIT/ORGANIZATION: NWS FALLBROOK	RANK/NAME:	
PHONE #: 731-36112	PHONE #:	
NOTIFICATIONS FOR OFF BASE RESPONSES		
	LEAVING	RETURNING
PMO 725-3888		
ODO 725-5617 (after hrs & wkends)		
USA EOD 819-553-8500		
AC/S O&T 725-5744/5745		
MISSION / INSTRUCTIONS		
SITE SURVEY TO PLOT ORDNANCE RESIDUE		
PERSONNEL RESPONDING		
LT SARGENT, SSGT DARROW, MSgt WALTER, 6, PIENHAIEN		
SGTs HARBAN, RHOADS, SIDERIS, CPL GARY		
NARRATIVE OF ACTIONS TAKEN		
<p>SWEPT / SURVEYED AREA IN QUESTION DIV NWS FALLBROOK. MARKED BOUNDARIES W/ GREEN FLAGS ON SOUTH/EAST BOUNDARY. THE ACCESS ROAD AND FIREBREAK ARE A GOOD NORTH/WEST BOUNDARY. A PILE OF 20 MM MK 7 DERLIDON ROUNDS WERE FOUND. SOME CONCERN REGARDING THESE, AS THEY WERE AN ALWAYS ARMED FUZE. ONLY REQUIRING A HARD IMPACT TO FUNCTION.</p>		
ORDNANCE DESTROYED	QTY:	N.E.W. Lbs.

65 (824x965x256 pcx)

20-mm PROJECTILES

16-inch Target Mk 6 Mod 1 and Mk 7 Mod 0

Guns used in.....16"/45
Mks 6 and 8

Over-all length, inches.....64

Diameter of base, inches.....15.977

Distance base to band, inches.....2.5

Diameter at bourrelet, inches.....15.977

Weight of loaded projectile, pounds.....2,240

Primer.....Mk 15 Mod 1

Tracer.....Mk 5

Mk 6 has no spotting dye; Mk 7 does. These target projectiles are designed to use the same ballistic as the 16-inch A.P. Projectile Mk 5.

16-inch Target Mk 9 Mods 1 and 2, and Mk 10 Mod 0

Guns used in.....16"/45 Mk 6 Mod 1
16"/50 Mk 7 Mod 0

Over-all length, inches.....72

Diameter of base, inches.....15.977

Distance base to band, inches.....2.5

Diameter at bourrelet, inches.....15.977

Weight of loaded projectile, pounds.....2,700

Primer.....Mk 15 Mod 1

Tracer.....Mk 5

Mods 1 and 2 of the 16-inch Target Projectile Mk 9 are physically the same. Different Mods



Figure 74. 16-inch Target Mk 9 and Mk 10

distinguish products of different contractors. The Mk 9's have no spotting dye.

Mk 10 is exactly like the Mk 9, except that it contains a spotting load.

These target shells match the 16-inch A.P. Projectile Mk 8 in ballistic traits.

Part I — Chapter I — Section II

20-mm PROJECTILES

20-mm A.A. H.E., H.E.-I., and B.L. & P. Mk 3 Mods 1—64

Over-all length, inches

With nose fuze.....3.275

Without nose fuze.....2.625

Diameter of base, inch.....0.74

Distance base to band, inch.....0.374

Width of band, inch.....0.16

Diameter at bourrelet, inch.....0.78

Filling

H.E.:.....0.0243 lb. tetryl or pentolite

H.E.-I.:.....0.0072 lb. incendiary mix;

0.0171 lb. tetryl or pentolite

Weight of loaded projectile, pound.....0.2714

Charge/weight ratio.....8.9%

Cartridge Case.....H.E.: Mk 2

H.E.-I.: Mk 2, 3, or 4

Primer.....H.E.: Mk 30

H.E.-I.: Mk 30 or 31

Fuzes.....Nose—Mk 26 Mods 0 and 1

The explosive filling of the H.E. projectile is press-loaded in three equal increments. The H.E.-I. projectile is similarly loaded, but the first increment consists of an incendiary mixture; the other two of H.E., either tetryl or pentolite.

66 (824x965x256 pcx)

U. S. EXPLOSIVE ORDNANCE

OF 1664

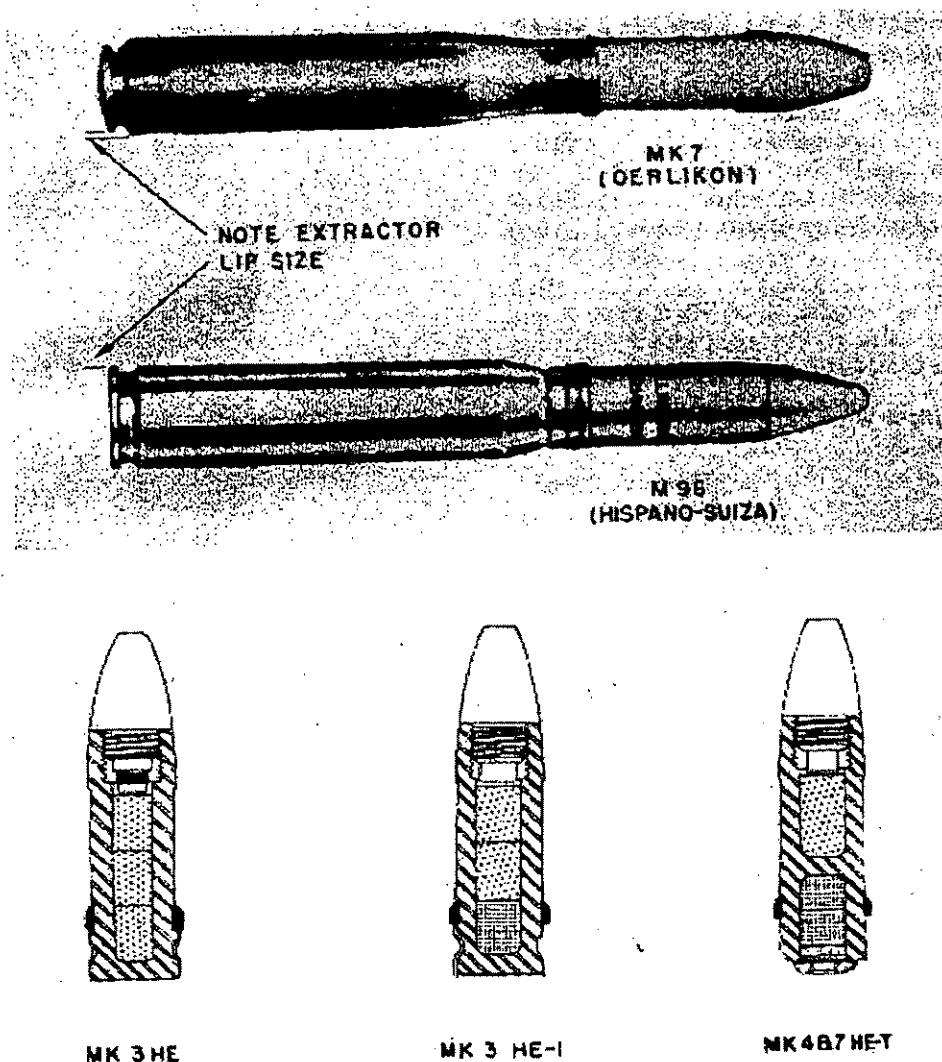


Figure 75 (Part 1). 20-mm Projectiles

This round is also issued B.L. & P., with an inert filler and a dummy nose cap.

Identification—marking and painting

Type	Color
H.E. (Tetryl)	White
H.E. (Pentolite)	Yellow
H.E.-I. (Tetryl)	Red
H.E.-I. (Pentolite)	Light pink

B.L. & P. Dark gray green
 The many modification numbers are to distinguish between products from different contracts.

20-mm A.A. H.E.-T. and B.L. & T. Mk 4
 Mods 1—28 and Mk 7

(May have Dark Ignition tracers.)
 Over-all length, inches.....3.025

COMMITMENT #

046-02

MCB EOD SUPPORT / AMMO EXPENDITURE SHEET

SCHEDULING		
DATE: 020215	START TIME: 0850	END TIME: 1035
RECEIVED BY: GW ROMERO		DATE RECEIVED: 020214
REQUESTOR INFORMATION		
RANK/NAME: JIM OLIVER		POINT OF CONTACT (OTHER THAN REQUESTOR)
UNIT/ORGANIZATION: NWS FALLBROOK		RANK/NAME:
PHONE # 731-5612		PHONE #
NOTIFICATIONS FOR OFF-BASE RESPONSES		
	LEAVING	RETURNING
PMO 725-3888		
CDO 725-6617 (after hrs & wkends)		
USA EOD 619-553-8500		
AC/S O&T 725-5744/5745		
MISSION / INSTRUCTIONS		
INSPECT ITEMS FOUND AFTER FIRE		
PERSONNEL RESPONDING		
GT SARGENT SSCT SCHUCHART		
NARRATIVE OF ACTIONS TAKEN		
<p>INSPECTED 4 ROCKET MOTOR'S, PROBABLY HAWK MISSILE, 1/2 MARKED INERT LOADED, 1) BLUE. NO SIGN OF ROCKET FUEL. ANY THING LIVE WOULD HAVE WENT PROPULSIVE FROM THE EXTREME HEAT. ALSO LOOKED AT 3 NAPALM BOMBS; NO NAPALM EMPTY. ITEMS WERE OBVIOUSLY THROWN IN AN OLD DUMP SITE. NO EXPLOSIVE HAZARDS FOUND.</p>		
ORDNANCE DESTROYED	QTY:	N.E.W. Lb



INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN



OCTOBER 2001

**MARINE CORPS BASE and
MARINE CORPS AIR STATION
CAMP PENDLETON**



"The principle purpose of DoD lands and waters is to support mission-related activities. Those lands and waters shall be made available to the public for educational or recreational use of natural and cultural resources when such access is compatible with military mission activities, ecosystem sustainability, and with other considerations such as security, safety, and fiscal soundness."

DoD Instruction 4715.3

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

MARINE CORPS BASE and MARINE CORPS AIR STATION CAMP PENDLETON, CA

Marine Corps Base (MCB) Camp Pendleton and Marine Corps Air Station (MCAS) Camp Pendleton share a Memorandum of Understanding (MOU) that outlines several functions for shared support and facilities management and maintenance. This also includes management of natural resources at MCAS Camp Pendleton. For this reason, this INRMP addresses MCAS Camp Pendleton as part of the overall Camp Pendleton landscape and not as a stand-alone section of the INRMP. Representatives of MCAS Camp Pendleton have participated in development of this INRMP.

APPROVAL

(NOVEMBER 2001 – NOVEMBER 2006)

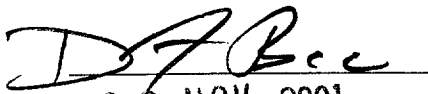
"Consistent with the use of military installations to ensure the preparedness of the Armed Forces, the Secretaries of the military departments shall carry out the program required by this subsection to provide for—

- The conservation and rehabilitation of natural resources on military installations;*
- The sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and nonconsumptive uses; and*
- Subject to safety requirements and military security, public access to military installations to facilitate the use"*

Sikes Act (16 USC 670a)

This Integrated Natural Resources Management Plan meets the requirements of the Sikes Act (16 U.S.C. 670a *et seq.*) as amended.

D.F. Bice
Major General, U.S. Marine Corps
Commanding General
Marine Corps Base Camp Pendleton
Camp Pendleton, California


09 NOV 2001
(date)

Steve Thompson
Acting Manager
California Nevada Operations Office
U.S. Fish and Wildlife
Sacramento, California

U.S. Fish and Wildlife
endorsement provided by letter
included in Appendix A.

C.F. Raysbrook
Director, South Coast Region
California Department of Fish and Game
San Diego, California

California Department of Fish
and Game endorsement provided
by letter included in Appendix A

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GLOSSARY

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EXECUTIVE SUMMARY

INTRODUCTION

This Integrated Natural Resources Management Plan (INRMP) sets the agenda for managing natural resources for the next five years (2002-2007) on Marine Corps Base (MCB) and Marine Corps Air Station (MCAS) Camp Pendleton (hereafter referred to collectively as Camp Pendleton, or the Base, unless otherwise specified). This INRMP was produced to meet requirements established by the Sikes Act Improvement Act (Public Law 105-85, Div. B Title XXIX, November 18, 1997, 111 Stat. 2017-2019, 2020-2033) and the implementing directives of the Department of Defense (DoD), the Secretary of the Navy, and the Commandant of the Marine Corps.

The integration of natural resources management with training and mission support requirements and responsibilities helps to ensure that Camp Pendleton continues to provide sustained support for the military mission and fulfill stewardship and regulatory requirements. This INRMP reflects Camp Pendleton's approach to natural resource management and natural resource related recreation. Presented in this document are natural resource management drivers (including regional laws, regulations, and drivers unique to circumstances at Camp Pendleton), goals and objectives, and course of action. The natural resource management course of action consists of projects, programs, and initiatives, with associated planned actions.

Camp Pendleton's INRMP is not intended for use by military personnel operating in the field nor does it replace existing Base Orders, policy, range and training operations guidance, or military management plans. Similarly, this INRMP does not replace existing natural resource related regulatory agreements, or management programs. Just as the Sikes Act Improvement Act is viewed as an "umbrella" law with regard to management of natural resources on military installations, this INRMP represents an "umbrella" document that encompasses all elements of natural resources management applicable to the installation, including compliance with the Terms and Conditions of relevant USFWS Biological Opinions and ongoing stewardship activities.

CAMP PENDLETON MISSION AND LOCATION

The mission of Camp Pendleton is "to operate an amphibious training Base that promotes the combat readiness of operating forces by providing facilities, services, and support responsive to the needs of Marines, Sailors, and their families" (MCB Camp Pendleton 2002). Camp Pendleton is the Marine Corps' premier amphibious training Base and its only west coast amphibious assault training center. The Base has been conducting air, sea, and ground assault training since World War II, providing a unique combination of natural and military resources for the training of Marines and other DoD personnel. For almost 60 years, Camp Pendleton has served as one of the nation's most important training bases and has contributed substantially to the success of our national security forces in conflicts and missions worldwide.

Camp Pendleton occupies approximately 125,000 acres of coastal southern California in the northwest corner of San Diego County. Aside from nearly 10,000 acres that is developed, most of the Base is largely undeveloped land that is used for training. Camp Pendleton is situated between two major metropolitan areas: Los Angeles, 82 miles to the north, and San Diego, 38 miles to the south. Nearby communities include Oceanside to the south, Fallbrook to the east, and San Clemente to the northwest. Aside from a portion of the Base's border that is shared with the San Mateo Wilderness Area and the Fallbrook Naval Weapons Station, surrounding land use is almost inclusively urban development, rural residential development, and agricultural farming and ranching.

NATURAL RESOURCES

Camp Pendleton's semiarid Mediterranean climate, varied topography (coastal plains, valleys, and rolling mountain foothills), diverse soil types, and high fire frequency are reflected in the type and distribution of plant communities and wildlife species present. Among the plant communities that characterize Camp Pendleton are oak woodlands, a range of chaparral and sage scrub communities (including the largest remaining contiguous Diegan coastal sage scrub), coastal bluff scrub, native and nonnative grasslands, coastal dunes, riparian communities, and wetlands (including isolated ephemeral wetlands unique to this region).

The diversity of habitat types contributes to the rich flora and fauna of Camp Pendleton. Over 800 plant species, hundreds of invertebrates, and more than 50 mammalian, 30 reptilian, 10 amphibian, 300 avian, and 60 fish species have been identified on Camp Pendleton. Most of the species on Base are considered native to the region, but as many as 20% of the plants and several wildlife species are exotic (nonnative) and, in some cases, invasive and may be causing the decline or local extirpation of native species (e.g., as a result of competitive exclusion, habitat alteration, predation, nest parasitism, etc.).

Eighteen (18) federally listed threatened or endangered species are found on, or transit through, Camp Pendleton. Included in this count is the southern steelhead trout (*Oncorhynchus mykiss*), which was recently rediscovered upstream of the Base on the San Mateo Creek and is pending listing for the Camp Pendleton area. Following is a list of the 18 federally listed threatened and endangered species on Base:

- Bald Eagle (*Haliaeetus leucocephalus*) - Known to occasionally transit the Base.
- Brown Pelican (*Pelecanus occidentalis*) - Known to frequently transit the Base.
- California least tern (*Sterna antillarum browni*)
- Coastal California Gnatcatcher (*Polioptila californica californica*)
- Least Bell's Vireo (*Vireo bellii pusillus*)
- Light-footed Clapper Rail (*Rallus longirostris levipes*)
- Southwestern Willow Flycatcher (*Empidonax trailli extimus*)
- Western Snowy Plover (*Charadrius alexandrinus nivosus*)
- Pacific Pocket Mouse (*Perognathus longimembris pacificus*)

- Stephens' Kangaroo Rat (*Dipodomys stephensi*)
- Southern Steelhead Trout (*Oncorhynchus mykiss*)
- Tidewater Goby (*Eucyclogobius newberryi*)
- Arroyo Toad (*Bufo californicus*)
- Riverside Fairy Shrimp (*Streptocephalus woottoni*)
- San Diego Fairy Shrimp (*Branchinecta sandiegonensis*)
- San Diego Button-Celery (*Eryngium aristulatum* var. *parishii*)
- Spreading Navarretia (*Navarretia fossalis*)
- Thread-Leaved Brodiaea (*Brodiaea filifolia*)

CAMP PENDLETON LAND USE

A variety of land uses occur at Camp Pendleton, however, the priority of Camp Pendleton is and will continue to be military training and support of that military training. The predominate types of land uses and activities on Base are military training and training support facilities, Base infrastructure (including roads, cantonment areas, and recreational facilities), and mission support activities.

Camp Pendleton provides training facilities for active duty and reserve Marine, Navy, Army, Air Force, and National Guard units, as well as other national, state, and local agencies. Nearly 60,000 personnel train at Camp Pendleton every year, with over 35,000 service members actually assigned to the Base.

Training exercises on Base are diverse and range from relatively small, isolated activities involving a few personnel to large, integrated operations of several thousand personnel engaging in multiple actions simultaneously. Training routinely consists of infantry operations, amphibious landings, live fire operations, field maneuvers using wheeled and tracked vehicles, rotary and fixed wing aviation exercises, and engineering and command post operations.

Designated areas, infrastructure, and facilities that support training operations include 31 training areas, impact areas for receipt of dud- and non dud-producing ordnance, more than 100 live-fire facilities, 4 amphibious assault landing beaches, and Special Use Airspace. In addition, Camp Pendleton supports ground based training exercises with two Combat Training Towns, one Military Operations in Urban Terrain facility, 19 obstacle courses, a Crucible course, rappel towers, aircraft mock-ups, two heavy equipment training sites, etc.

Similar to local municipalities, the Base provides military service members and their families with support facilities and services, including housing, water and sewage service, solid waste disposal, medical and dental services, schools, child care, employment assistance, and recreation opportunities. Camp Pendleton currently has more than 5,000 buildings and structures, 500 miles of roads, and nearly 1,000 miles of utility lines basewide.

Mission support activities on Camp Pendleton include natural resources management; fire management; infrastructure, facilities, and grounds maintenance; and morale, welfare, and

recreation community services. Included in the recreational services provided on Base are natural resources related recreational opportunities such as beach usage, hunting, fishing, hiking, camping, etc. Most of these services are also available to the general public.

Additional land use on Camp Pendleton occurs in the form of leases, easements, and other real estate agreements. Existing real estate agreements cover approximately 28,500 acres of the Base and include agricultural leases for row crop production and sheep grazing, San Onofre State Park, public utilities (including San Onofre Nuclear Generating Station) and transit corridors (including Interstate 5).

REGIONAL LAND USE

The region surrounding Camp Pendleton has been shaped by rapid population growth and increasing urbanization and development. Consequences of these trends include a decrease and displacement of agricultural acreage and open spaces, an increase in habitat fragmentation and isolation, and an increase in the number of native and endemic species and habitats that are becoming threatened with extinction. Studies have shown that San Diego County is leading the continental United States in the number of rare and federally listed threatened and endangered species.

Camp Pendleton and the adjacent Cleveland National Forest occupy some of the last significant open space and wildlife habitats in the coastal areas of southern California. With the exception of the Ocean and the Cleveland National Forest, urbanization is expected to eventually completely surround Camp Pendleton.

NATURAL RESOURCES MANAGEMENT COURSE OF ACTION

Camp Pendleton's stewardship and approach to natural resources management over its 60 years of operation has resulted in the maintenance of the last large contiguous area that reflects the rich diversity of species and habitat types formerly present in the region. Programs for stewardship, natural resource management, public access, and natural resource related recreation are presented in Chapters 4 and 5 of this INRMP. These chapters present program policies, goals, objectives, planned actions, and timelines for implementation of actions.

As defined by the SAIA, natural resource management programs on military lands should be consistent with the use of those lands to ensure the preparedness of the Armed Forces and should provide for: (1) the conservation and rehabilitation of natural resources; (2) the sustainable multipurpose use of the resources, which include hunting, fishing, trapping, and nonconsumptive uses; and (3) public access to military installations to facilitate the use of these resources, subject to safety requirements and military security. Camp Pendleton's natural resource management approach seeks to balance the twin goals of maximizing land use for military readiness and maintaining native habitats. Consistent with DoD and Marine Corps policy, the overriding focus of Camp Pendleton's natural resource management is to develop, promote, and refine a comprehensive, ecosystem based management program for

resource conservation. Such an ecosystem based approach is intended to facilitate maximum support for the Base's military training mission and infrastructure, while simultaneously promoting both the sustainability of native species and habitat diversity and compliance with applicable laws and regulations.

Planned actions that support the goals and objectives of the natural resources management course of action are presented as either Priority Planned Actions or Other Planned Actions. Priority Planned Actions are those projects and actions that Camp Pendleton has committed to accomplishing and/or are required by laws, regulations, or other agreement. Other Planned Actions are those projects and actions that the Camp Pendleton desires to accomplish, but due to restrictions and limitations on fiscal and personnel resources cannot commit to undertaking at this time. Camp Pendleton will seek appropriate funding and will set priorities based on the amount of funds actually received.

REGIONAL CONTRIBUTION AND ENVIRONMENTAL STEWARDSHIP

The Marine Corps views the management of natural resources on Camp Pendleton as one of its primary stewardship responsibilities to ensure the long term landscape diversity required to support the military training mission and regional biodiversity. Both Camp Pendleton and Headquarters Marine Corps continually invest significant resources (staff, time, and funds) to provide focused and high quality programs to manage the spectrum of environmental resources within its boundaries and regionally.

Camp Pendleton has developed a wide variety of management initiatives, several in collaboration with regional groups and other federal agencies, to manage the Base's natural resources. These initiatives include an Exotic Species Control Program, an Erosion Control Program, a Fire Management Program, an Environmental Education/Awareness Program, and a Long Term Ecological Trend Monitoring Program. In addition, Camp Pendleton supports numerous partnerships with other federal, state, local, and private resource groups to promote such programs as the North American Waterfowl Management Plan, Neotropical Migratory Bird Conservation, and Exotic Plant Species Control Program.

Along with Camp Pendleton's efforts to practice responsible stewardship of its lands and natural resources, the Base maintains an interest in regional planning. Camp Pendleton's interest is that, as regional development continues to encroach on natural habitats throughout southern California, Camp Pendleton lands will become increasingly important to sensitive species conservation in the region. Further, Camp Pendleton is required to ensure that its training lands do not become viewed as regional preserves within which training activities would then be prohibited or further limited. The Base does not want its land management efforts to protect open spaces on Camp Pendleton to be viewed by others as the "solution" for regional land use needs due to the perceived minimal economic and political cost of using land on the Base.

INTEGRATION, IMPLEMENTATION, AND ENFORCEMENT

While integration, implementation, and enforcement are a part of all the programs in this INRMP, several initiatives are geared specifically toward serving those functions, including: (1) the use of programmatic instructions; (2) environmental training, education, and awareness programs; (3) information management and Geographic Information Systems (GIS); (4) environmental planning and project support; (5) environmental inspection and compliance; and (6) enforcement mechanisms.

Integrated natural resource management and planning is an ongoing process at Camp Pendleton. This INRMP serves as a reference document and management tool that is expected to evolve as mission requirements, environmental and regulatory conditions, and natural resources management programs and initiatives evolve. In addition to revising the INRMP every five years, as required under the Sikes Act Improvement Act, Camp Pendleton is committed to more frequent (semiannual) document reviews to monitor progress of planned action implementation, make adjustments where necessary, and ensure the continued usefulness of this plan. The involvement of a cross section of land users and managers and resource agencies in the ongoing development, review, and implementation of this INRMP also helps ensure the continued integration and coordination of natural resources management programs with other Base and regional plans, programs, and decision making processes.

CHAPTER 1

INTRODUCTION

1.1 PURPOSE AND REQUIREMENT FOR THE INRMP

This Integrated Natural Resources Management Plan (INRMP) is intended to ensure that natural resource management at Marine Corps Base (MCB) Camp Pendleton and Marine Corps Air Station (MCAS) Camp Pendleton is implemented in a manner that provides sustained support for the military mission and, consistent with the use of Camp Pendleton to ensure the preparedness of the Armed Forces, provides for: the conservation and rehabilitation of natural resources on Camp Pendleton; the sustainable multipurpose use of those resources; and, subject to safety requirements and military security, public access to facilitate that use. To ensure frequent and continued use of land for military training, now and in the future, natural resource utilization must be (1) sustainable, (2) in accordance with laws and regulations, and (3) optimally integrated with existing Base plans and mission requirements, as mandated by both Department of Defense (DoD) and Headquarters, U.S. Marine Corps (HQMC) guidance. This INRMP is intended to integrate natural resource conservation and management efforts in support of land use and military mission requirements and responsibilities at MCB and MCAS Camp Pendleton (hereafter referred to collectively as Camp Pendleton, or the Base, unless otherwise specified).

This INRMP reflects Camp Pendleton's approach to natural resources management and stewardship and summarizes baseline information and agreements through which compliance with regulatory and planning processes, such as those required by the Sikes Act Improvement Act (SAIA), National Environmental Policy Act (NEPA), Endangered Species Act (ESA), and the Clean Water Act (CWA) is accomplished. This INRMP also fulfills other responsibilities with regard to Department of Defense Instructions (DoDI) and Directives (DoDD), as well as Department of Navy (DoN) and Marine Corps policies for natural resource planning, conservation, management, and rehabilitation in support of the Base's military training mission.

Camp Pendleton's INRMP provides technical guidance to persons planning and/or preparing installation approvals, management actions, orders, instructions, guidelines, Standard Operating Procedures, and other plans, for integrating natural resource management efforts into the Base's planning and decision making processes. It is not intended, however, for use by military personnel operating in the field. Field operations and activities are directed to adhere to guidelines, plans, orders, or other approvals that have been developed using this INRMP and have already had environmental compliance review and, where applicable, regulatory approvals and/or permitting (e.g., Base Order [BO] P3500.1_, *Base Range and Training Regulations*). This INRMP does not dictate land use decisions, but rather provides important information to support sound land use and natural resource management decisions.

National Historic Preservation Act requirements are not addressed in this INRMP. Cultural resource management issues (archaeological and historical) are addressed separately within Camp Pendleton's *Integrated Cultural Resource Management Plan* (ICRMP).

1.1.1 Regulatory Requirements and Legal Authority

The development and publication of this INRMP meets the requirements established by the SAIA and the implementing directives of the DoD, the Secretary of the Navy, and the Commandant of the Marine Corps (CMC). The Sikes Act (Public Law 86-797, 16 U.S.C. 670a *et seq.*), as it existed prior to the SAIA, authorized the Department of Defense and its component services to enter into partnerships with the Department of the Interior (DOI) (United States Fish and Wildlife Service [USFWS]), state fish and wildlife agencies, and private entities. These partnerships were to result in cooperative agreements or plans that were “mutually agreed upon” by the military agency and other partners. Though these cooperative plans *allowed* for the development of natural resources programs on military installations, they were *not* mandatory under the Sikes Act. The SAIA now makes the development and implementation of INRMPs mandatory, to provide for sound management of natural resources on military lands.

The SAIA requires the Secretaries of the military departments to prepare and implement INRMPs for each military installation unless exempted due to the absence of significant natural resources. Each INRMP shall include all elements of natural resources management applicable to the installation, including compliance with the terms and conditions of relevant Biological Opinions.

Development and implementation of this INRMP will fulfill the statutory requirements under the Sikes Act Improvement Act, Public Law 105-85, Div. B Title XXIX, November 18, 1997, 111 Stat. 2017-2019, 2020-2033. Though several other laws (e.g., Endangered Species Act, Clean Water Act, etc.) require military installations to protect sensitive biological resources, the SAIA is viewed as an “umbrella” law with regard to management of natural resources on military lands. Thus, this INRMP helps ensure that Camp Pendleton complies with other federal and state laws, most notably laws associated with environmental documentation, endangered species, water quality, and management of wildlife, in general.

1.1.2 Guidance and Required Elements

The SAIA, Marine Corps Order (MCO) P5090.2A (Environmental Compliance and Protection Manual, HQMC 1998), and the *Handbook for Preparing Integrated Natural Resources Management Plans for Marine Corps Installations* (HQMC 2000) were used to guide the preparation of this INRMP. As defined by the SAIA, natural resource management programs on military lands should be consistent with the use of those lands to ensure the preparedness of the Armed Forces and should provide for: (1) the conservation and rehabilitation of natural resources; (2) the sustainable multipurpose use of the resources, which include hunting, fishing, trapping, and nonconsumptive uses; and (3) public access to

military installations to facilitate the use of these resources, subject to safety requirements and military security.

The SAIA further states that, “Consistent with the use of military installations to ensure the preparedness of the Armed Forces, each [INRMP]... shall, to the extent appropriate and applicable, provide for:

- Fish and wildlife management, land management, forest management, and fish- and wildlife-oriented recreation;
- Fish and wildlife habitat enhancement or modifications;
- Wetland protection, enhancement, and restoration, where necessary for support of fish, wildlife, or plants;
- Integration of, and consistency among, the various activities conducted under the plan;
- Establishment of specific natural resource management goals and objectives and time frames for proposed action;
- Sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources;
- Public access to the military installation that is necessary or appropriate subject to the requirements necessary to ensure safety and military security;
- Enforcement of applicable natural resource laws (including regulations);
- No net loss in the capability of military installation lands to support the military mission of the installation; and
- Such other activities as the secretary of the military department determines appropriate.”

Implementation of this INRMP will be achieved through the accomplishment of Priority Planned Actions identified in Chapters 4 and 5. Priority Planned Actions are those actions that Camp Pendleton commits to implementing within the duration of this plan that will help ensure achievement of Camp Pendleton’s natural resource management goals and objectives as well as SAIA requirements. Other Planned Actions are also presented in Chapters 4 and 5 of this INRMP and will be implemented as funding and resources permit. Other Planned Actions represent desired, but not essential, actions that will further support the military mission, enhance integrated natural resource management and support stewardship of resources entrusted to the Marine Corps. To ensure no net loss in the capability of Camp Pendleton’s lands to fulfill military operational requirements, implementation of all planned actions will be conducted in an adaptive manner, adjusting management priorities and methodologies to accommodate changing natural resource and mission requirements. The DoD and Camp Pendleton’s military and civilian management and land users recognize that degradation of the land marginalizes its usefulness for realistic training, thereby degrading combat readiness now and for the future.

1.1.3 Natural Resource Management Drivers

Camp Pendleton, like all military installations, has needs or drivers that must be satisfied for the installation's mission to continue without disruption. Common with other federal agencies are legal or regulatory drivers, such as the federal ESA and CWA that require compliance to ensure continuance of the military mission. Unique to Camp Pendleton are a myriad of installation specific drivers that are defined by the Base's mission, land uses to support the mission, geographic location, and natural resources affected by the mission. Identification of the *primary* drivers at Camp Pendleton provided the basis for establishment of natural resource management goals and objectives and the goals of this INRMP.

As the Marine Corps' premiere training facility on the West Coast, the overarching natural resource management driver is to ensure usable land, airspace, and sea space remain available for the continuance of training. Such assurance requires beach access for amphibious landings; open space and a variety of vegetation types for personnel and wheeled and tracked vehicle maneuvers; firing ranges and dedicated impact areas for the receipt of ordnance; airspace which can accommodate hazardous live fire training, close terrain flying, take-offs and landings, heavy lift operations, etc.; and flexibility to alter resource utilization to accommodate changing mission objectives.

A number of Camp Pendleton's *primary* natural resource management drivers to ensure long term sustainability of the Base's military mission include the need to:

- Maintain sufficient undeveloped lands and varied vegetation for training as well as sensitive species;
- Monitor mission encroachment, both internally and externally;
- Manage all real property assets, real estate agreements, and military and nonmilitary activities, to ensure all land use activities are compatible with the mission and the needs of sensitive natural resources;
- Minimize wildfire frequency on Camp Pendleton to ensure human safety, protect property (on and off Base), and minimize land degradation and/or habitat type conversions;
- Prevent, where feasible, degradation of the land and associated sensitive resources to ensure realistic training and military readiness;
- Ensure compliance with the federal ESA, and other applicable federal natural resource regulations such as the CWA, Rivers and Harbors Act of 1899, and Migratory Bird Treaty Act, through avoidance and minimization of impacts to sensitive species and their habitats on Base; and
- Maintain a level of involvement in regional ecosystem initiatives to monitor and track the sustainability of natural resources of regional significance, relative to the Base's natural resource assets, to ensure Camp Pendleton does not become an "ecological island" and the last bastion of many endangered and threatened species.

Appendix B provides a detailed list of applicable regulatory and natural resource management drivers.

1.2 INRMP DEVELOPMENT, COORDINATION, EVALUATION, AND UPDATES

A core working group within the Environmental Security office, consisting of professional planners, natural resource specialists, and biologists, took the lead effort in coordinating development of Camp Pendleton's INRMP. This working group obtained focused input and guidance from individuals representing critical interests of Camp Pendleton and has ensured this INRMP reflects involvement of a cross section of land users and land managers at Camp Pendleton. A list of the Base's internal stakeholders involved in developing, reviewing, revising, and/or approving Camp Pendleton's INRMP is provided in Appendix C.

Camp Pendleton recognizes that natural resource management is a dynamic process and that the INRMP will need to be evaluated and revised frequently. Upon completion of the initial plan (October 2001), semiannual reviews and updates will be conducted by the Natural Resource Department to (1) accommodate changes in the military mission and natural resource management objectives, (2) incorporate lessons learned from Base projects, regional activities, or scientific studies, (3) incorporate agreements with regulatory agencies, and (4) ensure the continued usefulness of this plan. The Planning Branch within the Natural Resources Department of the Assistant Chief of Staff, Environmental Security is the Camp Pendleton lead for conducting the semiannual reviews and the INRMP liaison with the wildlife agencies.

During these semiannual reviews, natural resource management goals and objectives, Priority Planned Actions, and Other Planned Actions will be reviewed with the appropriate managers to document progress, identify additional actions required or desired, and revise implementation schedules and priorities. As part of these reviews the USFWS and California Department of Fish and Game (CDFG) will be involved in the evaluation of processes, results, and implementation of established milestones and timelines for specific projects and programs and a review of ecosystem, species, and habitat goals established in conservation management plans. New projects, data, understanding of natural processes and species, and lessons learned from completed and ongoing projects and practices will be incorporated as appropriate during these INRMP reviews.

The INRMP will be reviewed as part of every other semiannual review, to assess the effectiveness of integration. Findings from these reviews will be presented as part of an Environmental Impact Review Board meeting to update senior Base leaders of the status and effectiveness of the plan. During these reviews, the effectiveness of the INRMP in preventing "net loss in the capability of military lands to support the military mission" shall be evaluated.

Periodically, but in no case greater than every five years, the INRMP will be reissued as required by the Sikes Act. The continuous involvement of the USFWS, CDFG, and the public (through ongoing availability of this INRMP on the Base's web site) is anticipated to allow the reissuing of the INRMP on a more frequent basis.

The formal Headquarters, Marine Corps Environmental Compliance Evaluation (ECE) Program will also assess the implementation of the INRMP. The ECE requires an onsite evaluation every three years by an independent team established by Headquarters Marine Corps, an annual review and validation of a Plan of Action and Milestones (POA&M) that follows up formally on any deficiencies identified during the Headquarters Marine Corps ECE, and an annual Self-Audit Program.

The effectiveness of Camp Pendleton's natural resource management program and INRMP will be determined through periodic measuring and monitoring of species populations, habitat quantity and quality, and habitat values. These values will then be compared against established goals and commitments. Initially, threatened and endangered species goals (established in consultation with the USFWS) in the Camp Pendleton Estuarine and Beach Ecosystem Conservation Plan (Appendix D), Riparian Ecosystem Conservation Plan (Appendix E), and, when finalized, Listed Upland Species Management Program (Appendix F) will be used to determine effectiveness. As Camp Pendleton further refines its ecosystem based management approach, additional measures of success may be added.

1.2.1 Public Comment

The SAIA mandates, "each military department shall provide an opportunity for the submission of public comments on [the INRMP and on] changes to cooperative plans..." Previously, preparation of management plans did not require public involvement. Through amendments to the Sikes Act, members of the public, advocacy groups, and interested citizens have been afforded an opportunity to review and comment on the INRMP during its preparation. The public comment period on the initial INRMP was from 18 May 2001 to 2 July 2001. Copies of the INRMP were placed in libraries in San Clemente, Oceanside, and Fallbrook and it was available on the Camp Pendleton web site. Notifications of the availability of the INRMP and the public review and comment period were made by letter, mailed to over 65 individuals and organizations, and by published notices in the Orange County Register, North County Times, and the San Diego Union-Tribune. Appendix G documents public comments received on the Draft INRMP during that period and Camp Pendleton's response to those comments. Comments received after the deadline have been/will be considered during reviews and updates to the INRMP.

Camp Pendleton's Final INRMP will be posted and maintained on the Camp Pendleton web site for public review and comment. Changes will be posted to the web site as they are developed and identified for ease of review by interested parties. The web site will provide interested members of the public information on how and where to submit their comments. No specific deadlines are anticipated to be established so members of the public will have the opportunity to submit comments at any time. Comments received will be reviewed at the semiannual review following their receipt.

1.2.2 Resource Agency Coordination

Section 2904 of the SAIA states that the INRMP shall reflect the “mutual agreement” of the USFWS, the state fish and wildlife agency, and the DoD “concerning conservation, protection, and management of fish and wildlife resources.” The requirement for mutual agreement is further clarified by the distinction that “nothing in this title enlarges or diminishes the responsibility and authority of any State for the protection and management of fish and resident wildlife.”

The mutual agreement process with the U.S. Fish and Wildlife Service and the California Department of Fish and Game consisted of a series of “planning/coordination sessions” and document review meetings. Included in discussions were the requirements of the SAIA; guidance and requirements of the USFWS; comments, ideas, and recommendations on structure and format of the document; and regional conservation programs. This revision reflects the coordination process to date.

The Carlsbad Office of the USFWS was contacted in early April 2001 to arrange for discussions and review of the Camp Pendleton INRMP. No meetings or discussions were held until after the Draft Final INRMP was provided to them on 3 May 2001. Meetings and discussions were held on 8 May, 19 June, 3 July (joint meeting with CDFG), 19 July (joint meeting with CDFG), 7 August (joint meeting with CDFG), 16 August and 4 September (joint meeting with CDFG). California/Nevada Operations Office/Region I Sikes Act review guidance and requirements were published 31 July 2001 and provided to Camp Pendleton at the 16 August meeting. This guidance expanded upon USFWS requirements for environmental contaminants and migratory bird considerations in INRMPs.

The South Coast Regional Office of the CDFG was contacted in late January 2001 to arrange for discussions and review of the Camp Pendleton INRMP. The Draft Final INRMP was provided to the CDFG on 8 May 2001 with a short informal meeting. Meetings and discussions were held on 30 March, 6 June, 26 June, 3 July (joint meeting with USFWS), 19 July (joint meeting with USFWS), 7 August (joint meeting with USFWS), and 4 September (joint meeting with USFWS).

Involvement with the U.S. Fish and Wildlife Service and the California Department of Fish and Game is expected to continue indefinitely as the “planning/coordination sessions” will be ongoing. These agencies will participate, to the extent practicable based on staffing availability, in the semiannual review process by providing comments, recommendations, and input on the status of regional processes, surveys, and species.

1.2.3 ESA Section 7 Consultation

This INRMP reiterates the Base’s compliance with the Endangered Species Act (1973, as amended), as established through Biological Opinions issued by the USFWS for Camp Pendleton over the last several years, including the *Biological Opinion (1-6-95-F-02) for Programmatic Activities and Conservation Plans in Riparian and Estuarine/Beach Ecosystems on Marine Corps Base, Camp Pendleton* (the “Riparian BO,” USFWS 1995a)

and the pending Programmatic Uplands Endangered Species Management Plan (expected during Calendar Year 2002).

Many of the activities and actions proposed to be conducted as part of this INRMP are required as terms and conditions of existing Biological Opinions and, therefore, do not require Section 7 consultation. All other activities and actions have been and will continue to be evaluated for consistency with existing Biological Opinions or will be addressed in the pending Uplands consultation. Actions outside of the scope of existing Biological Opinions or the pending Uplands consultation will undergo separate Section 7 consultation on a project-by-project basis to determine if there are any adverse effects to listed species.

1.3 MILITARY NATURAL RESOURCES STEWARDSHIP

1.3.1 History of Military Natural Resources Management

The 25 million acres of public land managed by the DoD includes national assets of unique ecological value and biological diversity. Since 1823, military forces have been called upon to oversee or manage public lands and natural resources, including lands set aside as national parks (Leslie et al. 1996). Over the past four decades, the military has strengthened its commitment to natural resources management through adoption of both the philosophy and principles of ecosystem management, as described below.

Passage of the Conservation Programs on Military Reservations Act (Sikes Act) in 1960 (Public Law 86-797) provided the legal basis for wildlife conservation and public access for recreation on military land. The Sikes Act also authorized the collection of fees and the development of cooperative plans by the military, U.S. Fish and Wildlife Service, and state fish and game agencies. During this period, however, policies encouraged consumptive uses of natural resources, such as agricultural leasing mainly for grazing (Leslie et al. 1996). Revenues generated from grazing and other programs such as forestry and hunting and fishing programs became the major source of funding for natural resources management programs on DoD installations.

Growing public interest in natural resources, and a general shift in public policy toward "multiple use" of public lands and management for "sustained yield," brought increasing pressure on natural resources management in the 1970s and 1980s (Leslie et al. 1996). In addition, a host of environmental protection statutes (e.g., National Environmental Policy Act, the Endangered Species Act, Clean Water Act, Clean Air Act, etc.) added new requirements for DoD and other Federal land managers. The introduction of new environmental cleanup and hazardous waste control requirements, (e.g., Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] and Resource Conservation and Recovery Act [RCRA]) gave rise to DoD's multibillion dollar hazardous waste management and Installation Restoration programs.

During this time, little institutional (DoD) incentive developed to increase either staffing or funding for natural and cultural resources programs (Leslie et al. 1996). As natural resources management programs continued to pursue multiple and consumptive use management

strategies (e.g., row crop agriculture, grazing, timber, hunting and fishing, etc.) and as training lands became increasingly degraded, the need for natural resources management and ecological protection became apparent (Leslie et al. 1996). In response, DoD established a natural resources management program office and many installations shifted natural resources managers into newly created environmental offices. This development strengthened environmental research and management activities.

At the close of the 1980s, DoD Directive 4700.4 (Natural Resources Management Program) was issued, calling for development of Integrated Natural Resources Management Plans on military installations. These plans, which were intended to help balance competing interests, began to set the stage for a new approach to resource management on military installations.

1.3.2 Emergence of Ecosystem Management Philosophy

Throughout the 1990s, the military began to take stock of its natural resources management responsibilities and considered new approaches for improving program effectiveness. Initiation of strategic planning sessions resulted in new policy directives and instructions, funding priorities, strategic partnerships, resource inventories, and a transition to integrated planning. Military departments first completed audits of current programs and made commitments to complete biological resource inventories. Training for natural resources managers also improved. (Leslie et al. 1996)

To ensure support of the military mission while managing natural resources, it was recognized that land management needed to be integrated with operational and training objectives. Geographic Information System technology greatly facilitated analyses of land condition and training requirements and became a useful and widespread tool. By this time, the military had also begun reaching out to others in the government and the private sectors to provide additional expertise and to help develop solutions to common problems. The U.S. Fish and Wildlife Service, state fish and game agencies, U.S. Forest Service, and The Nature Conservancy were among the many organizations invited to serve as partners in developing new strategies for natural resources management on military lands. (Leslie et al. 1996)

The emergence of a new philosophy and ethic was realized in 1994, when the DoD published its “Ecosystem Management Policy Directive.” This policy stated that military installations will use ecosystem management to: (1) restore and maintain ecological associations that are of local and regional importance and compatible with existing geophysical components (e.g., soil, water); (2) restore and maintain biological diversity; (3) restore and maintain ecological processes, structures, and functions; (4) adapt to changing conditions; (5) manage for viable populations, and (6) maintain ecologically appropriate perspectives of time and space. (Leslie et al. 1996)

In 1995, the Department of Defense, including as many as 60 military trainers/operators and natural resources managers, along with The Nature Conservancy, federal and state land management agencies, several private sector interest groups, and The Keystone Center engaged in a major national dialogue (The Keystone Center 1996) to develop policy

guidance for enhancing and protecting DoD lands in a way that is integrated with the military mission. The dialogue (often referred to as the Keystone Dialogue) revealed strong support by the DoD for biodiversity conservation on military lands and affirmed that conservation of DoD's exceptional natural heritage is important to the military lands for the following principal reasons (The Keystone Center 1996):

- Biodiversity conservation is essential to sustaining the natural landscapes required for the training and testing necessary to *maintain military readiness*. Managing for biodiversity can help ensure that lands and waters are maintained in a "healthy condition" and thereby facilitate greater flexibility in land use for military operations.
- Biodiversity conservation is a central component of ecosystem management, which has been embraced as DoD's natural resources management strategy. Given DoD's significant investment in conserving and protecting the environment, this strategy promises the greatest return on investment -- *it is simply the right thing to do and the smart way of doing business*.
- Biodiversity conservation can *expedite the compliance process and help avoid conflicts*. Proactive management for biodiversity can provide greater certainty in mitigation for environmental impact assessment processes under the National Environmental Policy Act as well as consultation processes under the Endangered Species Act. On a number of installations, conservation efforts have helped avoid the designation of critical habitat by showing that the military's conservation plans provide adequate protection for habitat or have provided greater flexibility in training activities while meeting habitat protection requirements.
- Citizens demand that federal land managers demonstrate responsible stewardship of public lands. The practice of biodiversity conservation fosters good will within the communities surrounding military installations, which in turn *engenders public support for the military mission*. A strong commitment to stewardship also tends to strengthen institutional relationships among government agencies that would have some involvement in the resolution of resource management or environmental protection issues.
- Biodiversity conservation is essential to ensuring the integrity of the natural environments that are home to our nation's soldiers, sailors, airmen, and Marines. By helping to maintain aesthetically pleasing surroundings and expanding opportunities for outdoor recreation, managing for biodiversity can *improve the quality of life of our nation's military personnel and their families*.

This new, emerging philosophical shift and subsequent policy emphasis (see below) also gained support through increases in budgets for conservation programs during the past decade. In 1990, Congress recognized a need to enhance stewardship efforts and created the Legacy Resource Management (Legacy) Program. The Defense Appropriations Act of fiscal year 1991 directed DoD to allocate an additional \$10 million for natural and cultural

resources management. This amount increased to \$25 million in fiscal year 1992, and \$50 million annually in 1993, 1994, and 1995. Although the Legacy program has since been scaled back, DoD and headquarters offices of the Military Departments are expected to sustain funding for high priority conservation programs. (Leslie et al. 1996)

1.3.3 DoD Policy and Programs

In its implementation of ecosystem management as a tool for conserving natural resources on military lands, the DoD established the following principles (U.S. DoD 1994):

- Ecosystem management is the basis for future management of DoD lands and waters. It will blend multiple-use needs and provide a consistent framework for managing DoD installations, ensuring the integrity of ecosystems.
- Ecosystem management is a goal-driven approach to environmental management at a scale compatible with natural processes, recognizes social and economic viability within functioning ecosystems, and is realized through effective partnerships among private and government agencies.
- Ecosystem management is a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are integral parts of the whole.

The goal of ecosystem management, as established by DoD, is to ensure that military lands support present and future training and testing requirement while preserving, improving, and enhancing ecosystem integrity. Over the long term, this approach will maintain and improve the sustainability and biological diversity of terrestrial and aquatic ecosystems while supporting sustainable economies, human use, and the environment required for realistic training operations (U.S. DoD 1996).

The DoDI 4715.3 (Environmental Conservation Program) established the following principles and guidelines:

- Maintain and improve the sustainability and native biological diversity of ecosystems.
- Administer with consideration for ecological units and timeframes. Ecosystem management requires consideration of the effects of installation programs and actions at spatial and temporal ecological scales that are relevant to natural processes.
- Support sustainable human activities. People and their social, economic, and national security needs are an integral part of ecological systems, and management of ecosystems depends upon sensitivity to these issues.

- Develop a vision of ecosystem health. Existing social, and economic conditions should be factored into the vision.
- Develop priorities and reconcile conflicts.
- Develop coordinated approaches to work toward ecosystem health. Since ecosystems rarely coincide with ownership and political boundaries, cooperation across ownership is an important component of ecosystem management.
- Rely on best science and available data.
- Use benchmarks to monitor and evaluate outcomes.
- Use adaptive management. Ecosystems are recognized as open, changing, and complex systems. Management should be flexible to accommodate the evolution of scientific understanding of ecosystems.
- Implement through installation plans and programs. An ecosystem's desirable range of future conditions should be achieved through linkages with other stakeholders.

The DoD ecosystem management guidelines mirror the principles set forth within California's Coordinated Regional Strategy To Conserve Biological Diversity, a 1991 Memorandum of Understanding (MOU). The DoD continues to shift its focus to provide for the protection of individual species through management of ecosystems. This approach requires land managers to form partnerships for information exchange, pool resources for conducting mitigation and studying natural resources, and collaborate to develop a shared vision for ecosystems.

1.3.4 Camp Pendleton's Ecosystem Management Philosophy

Camp Pendleton's overall approach to managing natural resources reflects the principles of ecosystem management, consistent with DoD and Marine Corps policy. Camp Pendleton's natural resource management approach seeks to balance the twin goals of maximizing land use for military readiness and maintaining native habitats. The overriding focus of Camp Pendleton's natural resource management is to develop, promote, and refine a comprehensive, ecosystem based management program for resource conservation. Such an ecosystem based approach is intended to facilitate maximum support of the Base's military training mission and infrastructure, while simultaneously promoting both the sustainability of native species and habitat diversity and compliance with applicable laws and regulations.

With 18 federally listed threatened or endangered species known to exist on or use the Base and numerous additional sensitive plant and animal species, Camp Pendleton recognizes the need for an ecosystem approach to natural resource management, as traditional species-by-species (and project-by-project) management is inefficient and impedes mission accomplishment. An ecosystem approach is more efficient and balances the needs of all

ecosystem components (including mission, biological, economic, and human elements), provides comprehensive compliance with the Endangered Species Act, and integrates both DoD and DoI guidelines. Camp Pendleton's strategy for natural resource conservation and management includes habitat enhancement (e.g., exotics control, erosion control) and the avoidance and minimization of adverse impacts through implementation of programmatic instructions (published rules and guidelines for land users on Base).

Essential to ecosystem management is knowledge of the abundance, diversity, and status of resources both on and off Camp Pendleton. Development and maintenance of such inventories is aided by the use of Geographic Information System (GIS), Global Positioning System (GPS), and remote sensing technology, combined with periodic monitoring and surveys. The routine collection of data and the application of state-of-the-art technology maximizes the quality and quantity of information available to land managers, enabling adaptive management through the evaluation of potential impacts, biological trends, efficacy of management initiatives and identification of data gaps. Updated information and "lessons learned" may then be incorporated into management protocols and programmatic instructions for users of the Base. This ability to evaluate land use compatibility and to adaptively manage resource utilization minimizes the dedication of Camp Pendleton lands for single species conservation, while maximizing land area available for training.

Camp Pendleton's ecosystem management is intended to complement and support local and regional conservation efforts to conserve multiple habitats and species. Throughout the year, Camp Pendleton personnel meet with Marines, civilians, and community groups to discuss the Base's resources and conservation programs in an effort to promote ecosystem management principles. These meetings facilitate exchanges of approach and data sharing and support increased conservation awareness throughout the region and specifically with adjacent landowners. It is the Base's intent to proactively manage activities, infrastructure development, and natural resources in a manner that both complements regional plans and initiatives and is consistent with the need to ensure training flexibility. Camp Pendleton supports its natural resources being a link in the region's "matrix of biodiversity" and not an "island of biodiversity."

Camp Pendleton, along with other jurisdictions, including the County of San Diego (as part of the MSCP), and seven cities developing the MHCP, form the core of remaining open space in coastal southern California. While Camp Pendleton and the Marine Corps support regional conservation planning and management efforts, conservation of natural resources, particularly sensitive biological resources, at Camp Pendleton is being planned separately from other regional planning efforts out of the need to maintain *operational flexibility* and to avoid the creation of preserves on DoD lands that have been specifically set aside for military training. The Marine Corps believes that most military activities are, and will continue to be, generally compatible with the conservation of biological resources.

In considering participation in regional ecosystem conservation initiatives for resolving land use conflicts, the Marine Corps considers the following principles (Brabham 1995):

- The overriding mission of DoD is the protection of the national security of the United States, and military activities on departmental lands are vital to fulfillment of that mission.
- Military lands cannot be used for the mitigation of impacts of non-department actions occurring off the installation that affect the environment.
- Military lands cannot be set aside as perpetual environmental preserves.
- While conservation is, and shall be, practiced on our installations, we maintain the flexibility to adapt our defense mission to political and technological developments.
- The DoD's first priority shall be to integrate the management of natural and cultural resources with the military mission within the ecosystem supporting the installation.
- Such agreements, and their projects, will not detract from the DoD national security mission, now or in the future.

Camp Pendleton continues its efforts to practice responsible stewardship of its lands and natural resources, while maintaining an interest in regional conservation and management planning. Camp Pendleton is mindful of the regional conservation planning process that is ongoing, and has expressed concern to local agencies and jurisdictions about the effect regional development continues to have on natural habitats, not only off-Base, but on Base as well. The Base wants to ensure that its training lands are viewed primarily in terms of their intended land use, that of military training, and that natural resource management efforts are designed to be in support of that military mission. To that end, Camp Pendleton is working to ensure that its land use planning efforts, and those of the region, are complementary, and together meet the region's species and habitat needs so that Camp Pendleton's open spaces can continue to be used in support of the Base's mission.

1.4 INRMP AND NATURAL RESOURCE MANAGEMENT GOALS

Goals are general expressions of desired future conditions that represent the long-range aim of management (Leslie et al. 1996). Natural resource management goals have been established at various levels of command and are incorporated into the programs at Camp Pendleton. Goals that are specific to natural resource management, public access, and recreation programs are presented with the descriptions of those programs in Chapters 4 and 5.

1.4.1 Marine Corps Natural Resource Goals

Marine Corps natural resources management goals are as follows (HQMC 1998):

- *Preserve the Marine Corps mission access to air, land, and sea resources;*

- *Strengthen national security by strengthening conservation aspects of environmental security; and*
- *Preserve the opportunity for a high quality of life for present and future generations of Americans.*

1.4.2 Camp Pendleton Natural Resource Management Goals

Identification of natural resources management goals was necessary to develop a natural resources management course of action. These goals determine management regimes and help set priorities. They are the standards by which the practicality and desirability of management actions are measured. Natural resource management goals fall within three broad categories (HQMC 2000): (1) goals that support mission requirements, (2) goals that ensure compliance with natural resources management and protection laws, and (3) goals for participation in regional ecosystem initiatives.

Natural resource management goals specifically adopted by Camp Pendleton are as follows:

- Manage Camp Pendleton's natural resources in a manner that accommodates ongoing and evolving military mission requirements, and conserves and protects those resources in accordance with compliance requirements and stewardship principles.
- Encourage regional plans and incentives that address conservation of native biodiversity, ecosystem sustainability, and watershed management issues to help ensure and protect the long term viability of both Camp Pendleton's military mission and its natural resources.
- Provide for multiple land uses that are compatible with the conservation of natural resources and training requirements.

1.4.3 INRMP Goals

The purpose of the Integrated Natural Resources Management Plan is to document and assist, as required, in the development, integration, and coordination of natural resource management on Camp Pendleton. Goals established for the INRMP are as follows:

- Provide baseline information and conditions that supports daily decision making and compliance with regulatory and planning processes, such as those required by NEPA, ESA, and CWA.
- Identify, document, and facilitate the organizational capacity, support, and linkages necessary for successful implementation and administration of the INRMP and management of Camp Pendleton's natural resources.

- Integrate the various natural resources management programs on Base to reduce overlap and redundancy and help Camp Pendleton manage natural resources more effectively so as to ensure that Camp Pendleton lands remain available and in good condition to support the military mission.
- Show the interrelationships between current and proposed individual components of natural resources management (e.g., vegetation, wetland, fish and wildlife, hunting and fishing), mission requirements, and other land use activities.
- Establish specific natural resource program management goals, objectives, and actions that will be implemented during the duration of the plan and time frames for proposed actions.
- Identify lower priority projects that may be done if required resources become available.
- Establish a process for the periodic review, update, and reporting of program goals, objectives, and projects within the INRMP.

1.5 NATURAL RESOURCE MANAGEMENT STRUCTURE

To ensure Camp Pendleton's military mission and environmental conservation and management programs are compatible and mutually supportive, multiple Base organizations have a role in managing, and supporting, Camp Pendleton's natural resource management programs. The hierarchy and relationship among the Base organizations involved in natural resources stewardship is presented in Figure 1-1. A description of the role and function of each organization is presented in Appendix H.

The Assistant Chief of Staff, Environmental Security (AC/S ES) provides the lead and overall coordination of environmental compliance and natural resource management on MCB Camp Pendleton. This includes planning for, and coordinating the accomplishment of, established goals, objectives, and planned actions to support the military and stewardship missions. Technical guidance is routinely provided by the AC/S ES regarding soil and wetland conservation; vegetation, fish and wildlife, and listed species management; outdoor recreation; cultural resources protection; and GIS data management. The AC/S ES also provides technical environmental advice on both military and nonmilitary NEPA documents, facility planning and military construction (MILCON projects), maintenance activities, military operations, and other proposed actions that may affect natural and cultural resources. Information on the plants and wildlife present on MCB Camp Pendleton is gathered, maintained, and disseminated by the AC/S ES. Site specific data developed as part of projects and actions conducted by tenants or other Base organizations or staff sections are reviewed for technical accuracy and incorporated with other data in support of that project, ongoing conservation programs, and future activities. The AC/S ES serves as the lead for planning and resolving natural resource compliance issues such as wetland and endangered species regulatory requirements and serves as MCB Camp Pendleton's primary point of contact in dealing with regulatory agencies responsible for enforcement of

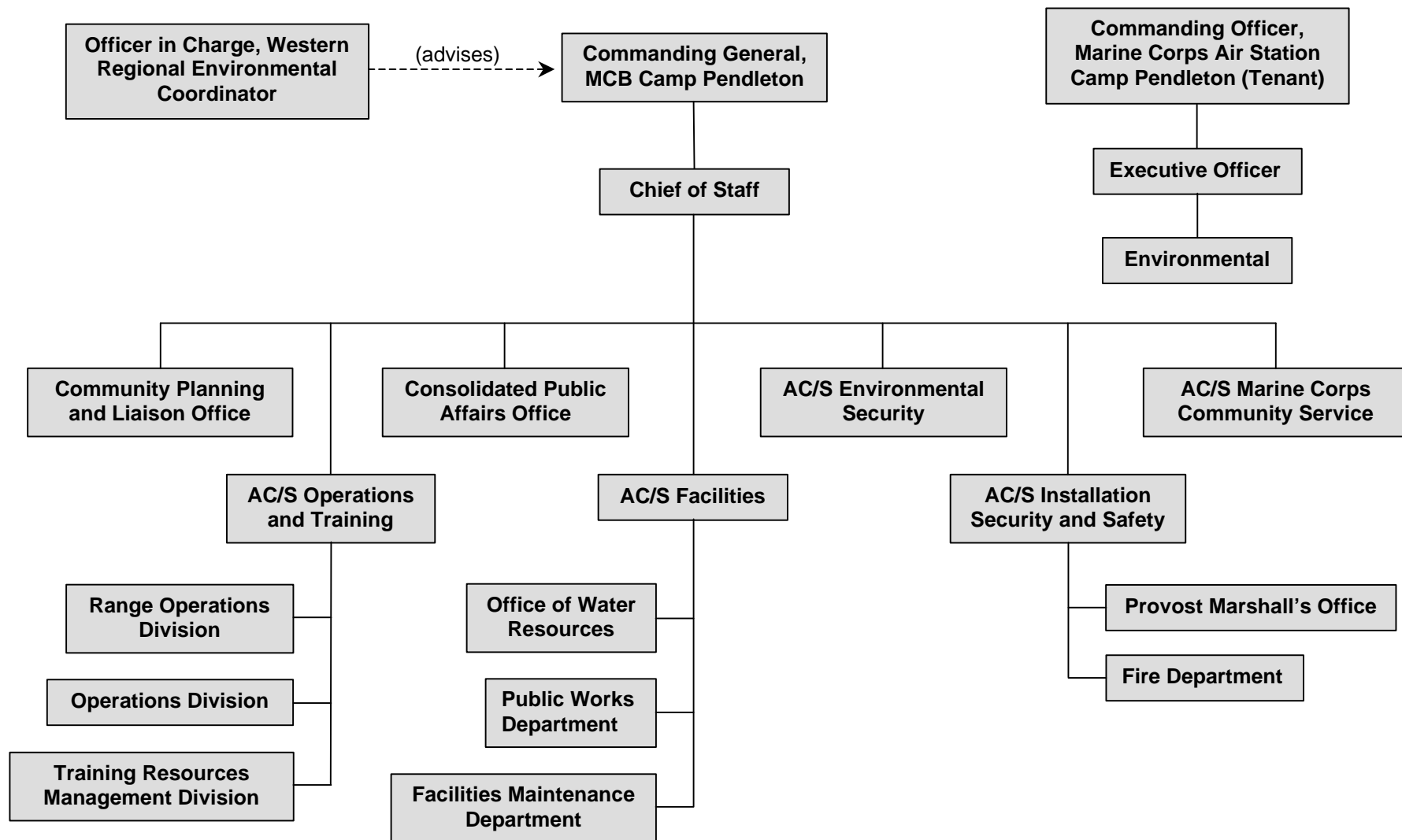


FIGURE 1-1. Organizational Chart for MCB and MCAS Camp Pendleton. (Note: not all offices are represented; only those with a direct or indirect role in natural resources management, integration, and/or enforcement are illustrated.)

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environmental regulations including endangered species and Clean Water Act Section 404/401 requirements. The hierarchy and relationship among the departments, divisions, and branches under the AC/S ES is presented in Figure 1-2 (a description of each is presented in Appendix H).

Aboard the Air Station, the MCAS Environmental Officer provides policy development, program oversight, data management, and regulatory liaison for natural and cultural resources. Although the Air Station and Marine Corps Base are separate commands, staff regularly collaborates to ensure that management and planning efforts are coordinated between the installations.

1.6 RELATIONSHIP OF THE INRMP TO EXISTING PLANS AND ORDERS

The INRMP is not intended to replace existing Base Orders, policy, range and training operations guidance, or military management plans. Rather, the purpose of the INRMP is to document and assist, as required, in the development, integration, and coordination of natural resource management programs with other Base plans and programs. Where natural resource programs are currently not documented through formal planning efforts, the INRMP may serve as the means to formally establish such programs. Moreover, this INRMP is intended to facilitate the integration of existing natural resource management actions (plans and programs) with the primary military mission of Camp Pendleton: military training and support.

1.7 NATURAL RESOURCE MANAGEMENT PROGRAM AND PROJECT FUNDING

Camp Pendleton will seek appropriate funding for its natural resources management program and will set priorities based on the amount of funds actually received. The Priority Planned Actions within this INRMP are those actions that Camp Pendleton commits to implementing by the end of the calendar year noted after the action. Actions identified as Ongoing, are carried out each year or as required. From a funding perspective, Priority Planned Actions that require funding can generally be compared to Class 1 or Class 2 budget projects. (Class 1 projects are those that must be done because the Base is out of compliance and therefore must be funded in the current fiscal year to correct the noncompliance situation or to remain in compliance in the current fiscal year. Class 2 projects are those that should be funded in order to remain in compliance within the deadlines given for compliance.) Other Planned Actions are identified for implementation as funding and resources permit and can generally be compared to Class 3 projects (those that are not explicitly required by law but support natural resource management goals and objectives).

Budget development and INRMP implementation are both continuing and interrelated processes. Natural resource funding requests should support the INRMP planned actions and vice versa. While not all natural resource related expenditures are identified within the INRMP (e.g., staff, supplies, overhead funding), all planned actions within the INRMP *that*

require funding should be incorporated into budget planning documentation (e.g., Program Objectives Memorandum and biannual budgets). As budgets are reevaluated and funding allocations change, so must INRMP planned actions, prioritizations, and implementation years be adjusted, reevaluated and possibly reprioritized. The tracking and monitoring of progress toward INRMP goals and objectives and the adaptive management of resources will require revisions/reprioritizations of INRMP planned actions and corresponding budget requests.

Costs associated with the execution of Priority Planned Actions and Other Planned Actions required identification at the earliest practicable stage of a proposed action. The Base organization responsible for implementation of the action is responsible for budgeting for and funding the action.

1.8 ORGANIZATION OF THE INRMP

Chapter 1 presents background and introductory information. Described within this chapter are legal requirements, mandates, and authority to prepare the INRMP; DoD's and Camp Pendleton's philosophy on ecosystem management; and organizational roles and responsibilities for natural resource management; program funding approach; and review and update process for the ongoing INRMP process.

Chapter 2 describes the location and mission of Camp Pendleton, existing and historic land uses, both military and nonmilitary, and land uses and conservation programs within the region surrounding the Base. Also presented within this chapter are the affects that regional issues have on Camp Pendleton.

Chapter 3 provides Camp Pendleton's natural resource baseline information, describing the physical, biological, and regulatory setting in which the Base currently operates.

Chapters 4 and 5 provide an historic account of natural resource management at Camp Pendleton, current and planned program descriptions, goals and objectives, planned actions, and timelines, and the integration and enforcement mechanisms in place for natural resources management, public access, and natural resource related recreation.

Throughout the INRMP, program goals, objectives, and planned actions are identified that have been established to help achieve Camp Pendleton's natural resource management goals and fulfill needs established by drivers. Projects and planned actions are separated into Priority Planned Actions and Other Planned Actions. Priority Planned Actions are those projects and actions that Camp Pendleton has committed to accomplishing and/or are required by laws, regulations, or other agreement. The commitment of funding for Priority Planned Actions are driven by regulations or agreements and is not a commitment of Camp Pendleton to obligate funds prior to Congressional authorization. Other Planned Actions are those projects and actions that Camp Pendleton desires to accomplish, but due to restrictions and limitations on fiscal and personnel resources cannot commit to undertaking at this time. During semiannual reviews, Other Planned Actions will be reviewed to see if sufficient resources are available to allow them to be conducted.

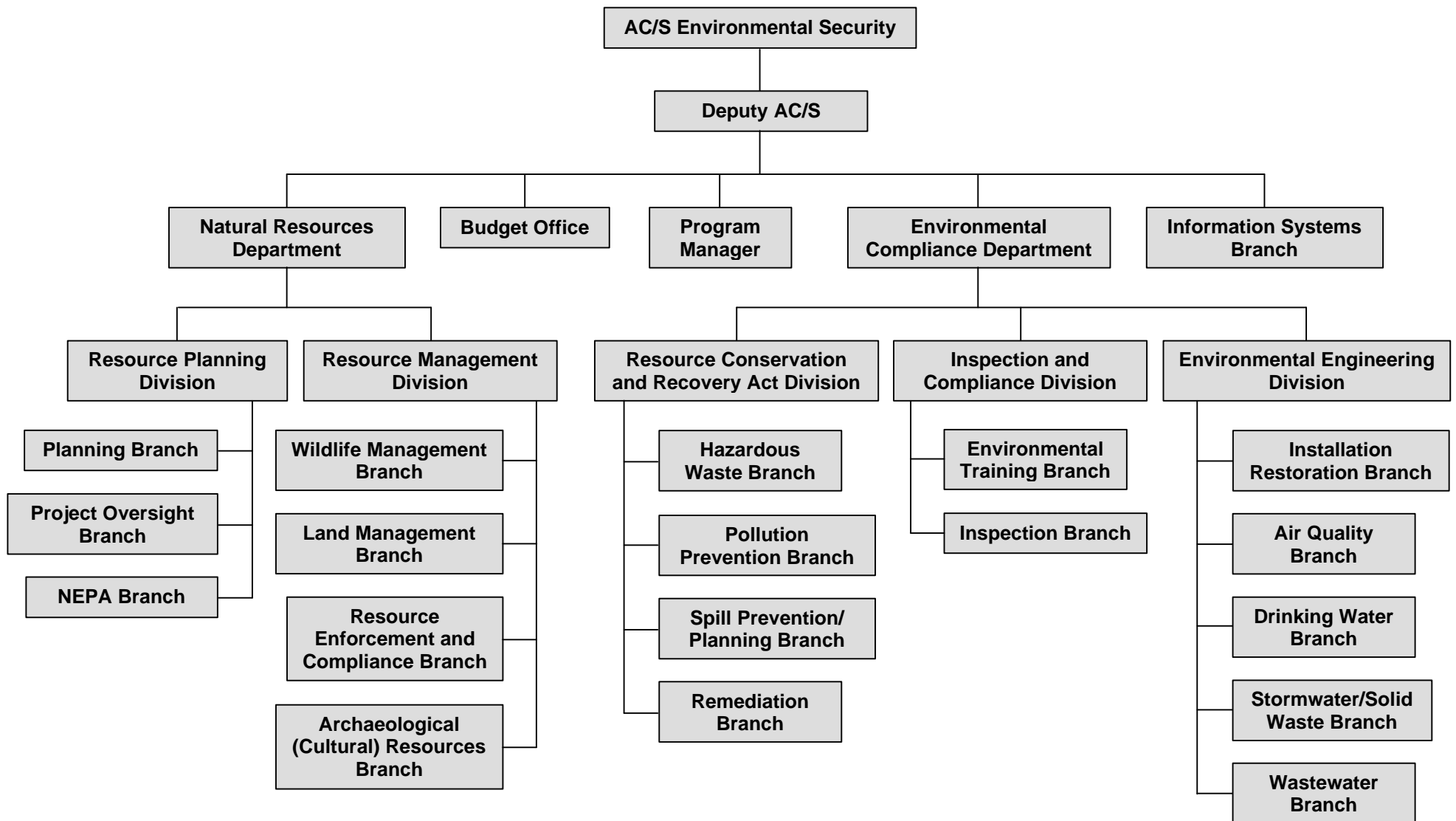


FIGURE 1-2. Organizational Chart for AC/S Environmental Security, MCB Camp Pendleton.

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CHAPTER 2

MISSION, LAND USE, AND REGIONAL SETTING

2.1 LOCATION AND MISSION

2.1.1 Location

Camp Pendleton occupies approximately 125,000 acres of largely undeveloped land, with approximately 17 miles of coastline, in northwestern San Diego County of southern California Figure 2-1. Camp Pendleton is situated between two major metropolitan areas: Los Angeles, 82 miles to the north, and San Diego, 38 miles to the south. Nearby communities include Oceanside to the south, Fallbrook to the east, and San Clemente to the northwest. Camp Pendleton shares portions (approximately 8 miles) of its northern border with the San Mateo Wilderness Area of the Cleveland National Forest and its eastern border with the Fallbrook Naval Weapons Station. Aside from the Wilderness Area and the Naval Weapons Station (which are both largely undeveloped land), surrounding land use includes urban development, rural residential development, and agricultural farming and ranching.

2.1.2 Military Mission

The mission of Camp Pendleton is “to operate an amphibious training Base that promotes the combat readiness of operating forces by providing facilities, services, and support responsive to the needs of Marines, Sailors, and their families” (MCB Camp Pendleton 2002). Camp Pendleton is the Marine Corps’ premier amphibious training Base and its only west coast amphibious assault training center. The Base has been conducting air, sea, and ground assault training since World War II, providing a unique combination of natural and military resources for the training of Marines and other Department of Defense personnel. For almost 60 years, Camp Pendleton has served as one of the nation’s most important training bases and has contributed substantially to the success of our national security forces in conflicts and missions worldwide.

Camp Pendleton is arguably one of the busiest DoD installations in the United States. Approximately 40-45,000 training events are scheduled at Camp Pendleton each year. These events range from small unit training to Regimental and Marine Expeditionary Brigade (MEB) exercises. Nearly 60,000 Service members train at Camp Pendleton every year. The Base provides training facilities for many active duty and reserve Marine, Navy, Army, Air Force, and National Guard units, as well as other national, state, and local agencies.

The Base is the home to the First Marine Expeditionary Force (IMEF), the First Marine Division (1st MARDIV), First Force Service Support Group (1st FSSG), Marine Aircraft Group (MAG)-39 (an element of the Third Marine Aircraft Wing [MAW]), and many tenant units, including the Marine Corps Tactical Systems Support Activity (MCTSSA), Assault Craft Unit 5 (a U.S. Navy command), Naval Hospital Camp Pendleton, Naval Dental Clinic Camp Pendleton, the Field Hospital Operations and Training Command (a U.S. Navy command), an

Army Reserve Center and the Weapons and Field Training Battalion (an element of Marine Corps Recruit Depot, San Diego). Forces of the IMEF are continuously deployed worldwide to meet national security objectives as directed by the National Command Authority.

To accomplish the national security mission, Marines and other Department of Defense personnel must be trained in all requirements for responding to national security threats. Training activities include, but are not limited to: amphibious landings, use of tracked vehicles, infantry and vehicle maneuvers, artillery and small arms firing, aerial weapons delivery, engineer support operations, logistics support, field combat service support, communications, airlift support for troops and weapons, equipment maintenance, and field medical treatment. Camp Pendleton units train with some of the most modern and sophisticated weapon systems and equipment available. Such technology is constantly evolving to stay ahead of weapon system advancements by threat forces. Continual training to maintain personnel/unit proficiency is a critical component of combat power and is the primary mission of the Base.

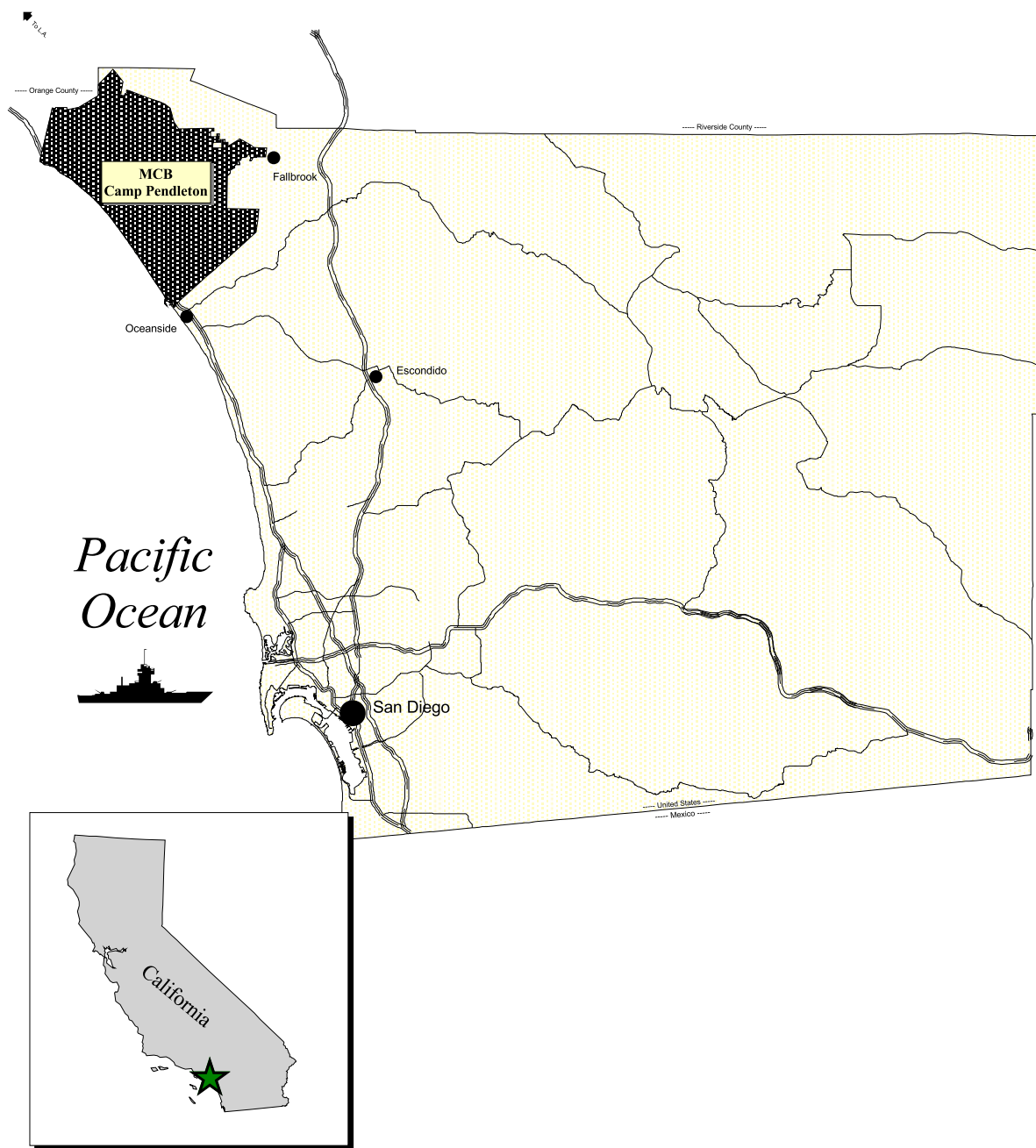
Training on Base is supported by a wide range of Marine Corps and Department of Defense service support activities, including: an airfield and aviation landing areas, ammunition storage areas, radar and communication facilities, supply warehouses, motor vehicle storage and maintenance facilities, recreational activities, bachelor and family housing facilities, medical and dental services, military security, child and family care services, and fire fighting.

2.2 HISTORIC LAND USE

Historic land uses and regional growth over the past 200 years, have significantly influenced not only the physical appearance of Camp Pendleton and its environs, but also the ecological setting in which the Base finds itself today. Much of southern California's biodiversity and its high degree of species endemism have been significantly impacted through historic land use and increasing human population and development.

The land currently occupied by the Base has a long history of human presence (>10,000 years), from prehistoric peoples through Spanish colonials (1769-1821) and Mexican (1821-1848) and American ranchers (1848-1942). Cattle grazing and, later, crop cultivation continued in the region until the U.S. government purchased the land in 1942. It is thought that the early Native Americans regularly burned patches of land in order to clear them. While fire ignitions and burn frequency at Camp Pendleton are much higher today than at the time the military acquired the property, burn patterns may reflect prehistoric ones more closely than those resulting from fire suppression policies in southern California (Minnich 1983).

During the Rancho period, agriculture and livestock were the economic base of the region. Former residents of Rancho Santa Margarita put the number of cattle grazed at "more than 25,000 head" (Grayler, pers. comm. 1989) on about 82,500 acres. It is believed that sheep were introduced in the late 1800s. Subsequent owners of the property also used the land for grazing, and grazing leases continued after the military took over the property during World War II. Camp Pendleton was reputed to have the finest grazing land in southern California during the early 20th Century.



Not to Scale

Figure 2-1
Camp Pendleton
Regional and Vicinity Map



Map Source:
AC/S Environmental Security
GIS Branch
October 2001



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Grazing and farming activities were supported by El Camino Real, the old thoroughfare used by the missionaries that became Highway 101 and used to follow the Basilone Road alignment before it was moved closer to the coast. Infrastructure development included a railroad, which ran from San Diego to Oceanside, inland along the Santa Margarita River to Temecula, and connected to the transcontinental railroad at San Bernardino. The tracks were generally ten to thirty feet above the riverbed in the canyon. Thirty miles of track were washed out in 1884 and again in 1891. This route was then replaced by a more secure route along the coast.

First established in the Las Flores/Las Pulgas basin in 1897, a bean farm covered approximately 1,980 acres by 1943. Other areas farmed on Camp Pendleton over the years include the Las Pulgas, San Mateo, and San Onofre valleys; Ysidora Basin; the Chappo area (now the Supply Depot and airfield); the coastal bench from Oceanside to San Onofre east and west of Interstate 5; and Stuart Mesa. At one time, farmed areas of the Base totaled around 10,000 acres (Zedler et al. 1997). Stuart Mesa was “a mixture of hog wallows and dune sand in 1938” (AC/S ES historical files). Coastal farms were un-irrigated, as were parts of the San Onofre and Las Flores areas. Irrigated farms included Ysidora Basin, Stuart Mesa, San Mateo, and parts of San Onofre. Truck farming started in the San Onofre valley in 1925. The Cristianitos area was first leased in 1948, and the Talega area was farmed until 1953. A 3,000-acre guayule (*Parthenium argentatum*) “Emergency Rubber Project” was in place that included most of the coastal bench lands north of Horno Canyon. Other historical crops included lemons, nursery stock, dry-land farmed lima beans, tomatoes, strawberries, sweet corn, barley, bulbs, and several types of vegetables, vegetable seed, flowers, and potatoes for the California Potato Experiment Station. In 1944 and 1945, the Base tried to cancel agricultural leases, but gave up after a general protest. It was decided that the “agricultural economy of the entire U.S. would have been affected,” particularly because of vegetable seed and poinsettia production.

In 1942, the Department of the Navy purchased 130,000 of the 181,000 total acres of the *Rancho Santa Margarita y Las Flores* property and converted these lands into a military training center for World War II. Later that year, President Franklin D. Roosevelt named the Base in honor of Major General Joseph H. Pendleton. By 1946, Camp Pendleton had become the headquarters for all Marine Corps activities on the west coast. Over the past 60 years, nearly 5,000 acres has been disposed of by the DoD, resulting in Camp Pendleton’s current size of approximately 125,000 acres.

Camp Pendleton is the Marine Corps’ only amphibious training base on the west coast and has been, is, and will continue to be responsible for the training and deployment of Marines throughout the Pacific Region. For nearly 60 years, the Base has provided a unique combination of natural and military resources for training Marines in every conflict since World War II, contributing substantially to the success of national security objectives around the world.

On August 7, 1942, the United States government landed Marines on Guadalcanal, as the first major American offensive of World War II. Camp Pendleton’s top priority became training Marines in amphibious assault landings. After the assault on Tarawa in 1943, amphibious training and facilities to support these activities increased ten-fold. From that point forward, thousands more Marines were trained for the Pacific Theater at Camp Pendleton during World War II, including the Third, Fourth, and Fifth Marine Divisions. On February 19, 1945 more

than 70,000 combat-ready Marines from 880 ships, most of them from Camp Pendleton, assaulted the beaches of Iwo Jima.

The First Marine Division left Camp Pendleton in 1950 to reinforce the Pusan perimeter in Korea, after a June 25, 1950 invasion of South Korea by eight divisions of the North Korean People's Army. An amphibious assault landing at Inchon followed on September 15, 1950 and at Chosin Reservoir, seven divisions of the Chinese Communist Army engaged Marines in a failed attempt to prevent them from leaving. In all, more than 200,000 Marines were trained at Camp Pendleton for service during the Korean Conflict. Development around the Base expanded as a result of this Conflict, with \$20 million spent on expanding existing facilities and constructing new ones at Camp Horno and the tank park at Las Flores.

In Vietnam, Marines were providing assistance as early as 1962. In 1965, the 7th Marine Regiment saw the first major American engagements during Operations *STARLITE* and *PIRANHA*. By June 1966, the entire 1st Marine Division had left Camp Pendleton and was in action in Vietnam. For more than ten years, tens of thousands of Marines were trained at Camp Pendleton and sent to war in Vietnam. Development across the Base continued from 1958 through the mid-1970s, as Vietnam became a priority for Camp Pendleton.

Again, in August 1990, Marines from Camp Pendleton were among the first sent overseas. This time by President George Bush to assist in the defense of Saudi Arabia. Then, in February 1991, the 1st Marine Division supported by the 3^d MAW and 1st FSSG was called upon to initiate the attack to retake and liberate Kuwait from the occupying Iraqi Army.

In more recent times, military operations, other than war, have increased in frequency and Camp Pendleton Marines have been increasingly called upon to assist in these missions, including Operation *INTERFET* in East Timor, and Operation *ALLIED FORCE* in Kosovo. As stated in the USMC's *Strategy 21* doctrine, "Whether winning our Nation's battles or reducing human suffering due to man-made or natural disasters, the Marines unique qualities offer the Nation an unparalleled ability to respond to threats or crises, influence world peace, and promote peace and stability."

2.3 CURRENT LAND USE

A variety of land uses occur at Camp Pendleton, however, the priority of Camp Pendleton is and will continue to be military training and support of that military training. While some locations support only one type of activity (e.g., agricultural row crops and dud-producing impact areas), many areas on Base support multiple activities. The following categories illustrate the general locations and predominate types of land uses on Base (Figure 2-2): military training and training support facilities, Base infrastructure and mission support (including cantonment and recreational facilities), and real estate agreements and leaseholders.

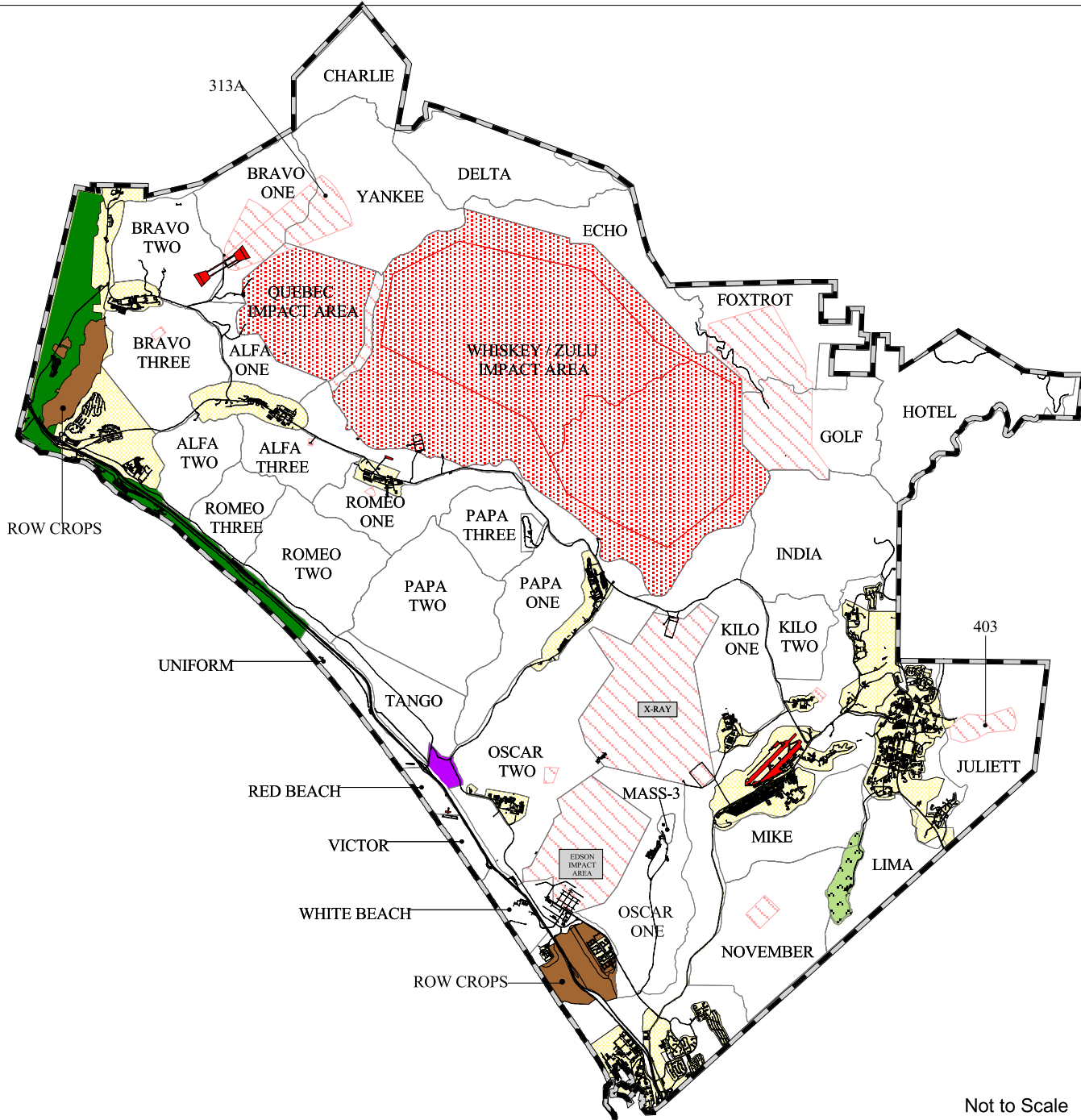














Figure 2-2
Camp Pendleton Land Use

-  CPMCB Boundary
-  Training Area Boundaries
-  Firing Range Impact Areas (Non-Dud Producing)
-  Marine Corps Air Station
-  Central Impact Area (Dud-Producing)
-  Buildings, Paved Roads & Parking Areas
-  Cantonment
-  Historical Site
-  Golf Course
-  Row Crop Agriculture
-  San Onofre State Park & Beach
-  Helicopter Outlying Landing Field (HOLF)



Map Source:
AC/S Environmental Security
GIS Branch
October 2001



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2.3.1 Military Training and Training Support Facilities

Although the combat training environment, weapons, and tactics have changed over the years, Camp Pendleton's purpose has remained constant: *it is first and foremost a training base, designed to mold young men and women into the country's finest fighting force*. As a training base, Camp Pendleton must maintain its ability to provide ready, capable Marines in the right place, at the right time, and with the right training in order to excel in the uncertain challenges of the future.

Camp Pendleton actions are guided by the Commandant of the Marine Corps': "[Bases and stations] provide the means by which we develop, train and maintain a modern force that is prepared to win our Nation's battles. Installations are the platform from which we project expeditionary power by deploying and sustaining Marine Air-Ground Task Forces. They will continue to grow in importance as we fully implement our future doctrine and the 'reach back' requirements it demands." The following statement captures the sentiments of the Commandant regarding the future of training for the Marine Corps at Camp Pendleton: "Increased home training, combined with decreased overseas training, equals more training projected for Camp Pendleton." The Commandant further emphasized, "Without [Camp Pendleton], there is no place to live and no place to train" (Commanders Encroachment Brief, December 2000). Future warfighting guidance from the Commandant also captures the essence of natural resource management issues facing the Commanding General at Camp Pendleton: "Emerging warfighting concepts, plus [Base Realignment and Closure] impacts, and more home training, means Camp Pendleton is busy, and going to get busier, and this creates a dilemma for the Base CG." Regardless of the difficulties faced by Camp Pendleton, the Base must ensure that Marines, individually and as a unit, are ready to answer the Nation's call, anytime, anywhere.

Marines are required to be trained in all U.S. Marine Corps mandated requirements and to be combat ready for global deployment in pursuit of mandated national security missions. Training activities must include, but are not limited to: amphibious landings, use of tracked vehicles, personnel maneuvers, artillery and small arms firing, aerial weapons delivery, engineer support operations, logistics support, field combat service support, communications, airlift support (re-supply) of troops and weapons, equipment maintenance, and field medical treatment. Appendix I identifies Mission Essential Task Lists (METLs) for several of the tenant units of the Base.

Camp Pendleton provides training facilities for many active duty and reserve Marine, Navy, Army, Air Force, and National Guard units, as well as other national, state, and local agencies. Camp Pendleton's population can reach 90,000 people daily. Nearly 60,000 personnel train at Camp Pendleton every year, with 35,000 service members actually assigned to Camp Pendleton.

Camp Pendleton is most heavily used by and structured to support the IMEF. The IMEF is the command element for the 1st MARDIV, 1st FSSG, and 3d MAW. The latter is headquartered at MCAS Miramar. One of 3rd MAW's four Aircraft Groups, MAG-39, a helicopter Group, is based at MCAS Camp Pendleton. Forces of the IMEF are continuously deployed worldwide to meet national security objectives as directed by the National Command Authority. The Base

also supports several specialized schools, Headquarters and Support Battalion, Security Battalion, Assault Amphibious Schools Battalion, and a Reserve Support Unit. Camp Pendleton's training ranges are heavily used not only by active Marine and Navy units, but also by reserve Marines, Army National Guard, local community law enforcement agencies, and private research firms for weapons testing.

2.3.1.1 MANEUVER TRAINING

Camp Pendleton's use of more than 200 square miles of land space for training includes 31 training areas, a Central Impact Area (CIA) of more than 32,000 acres, more than 100 live-fire facilities, 4 amphibious assault landing beaches, and Special Use Airspace.

Amphibious Operations

The Base is situated next to a variety of offshore ocean training areas that extend Camp Pendleton's operational capabilities. The waters immediately west of the Base, known as the Camp Pendleton Amphibious Assault Area (CPAAA), contain 294 square miles of amphibious assault training and maneuvering areas, including the seaward portion of restricted airspace area R-2503A. The CPAAA includes an area dedicated to Landing Craft Air Cushion (LCAC) training and operations, as well as the Camp Pendleton Amphibious Vehicle Area. No live ordnance is utilized within the CPAAA during amphibious training operations except those operations that take place within the seaward portion of R-2503A; however, extensive Naval surface, subsurface, and aviation operations take place during such training evolutions. The ocean bottom is designated as the "floor" of the CPAAA while the "ceiling" is considered to be 700 feet mean sea level (MSL), except that portion that lies within R-2503A which extends to 2,000 feet MSL (Figure 2-3).

Although Camp Pendleton also has more than 17 miles of coastline, less than 10 miles of those are normally available for training activities, and only at four amphibious landing beaches (Red, Green, White, and Blue beaches). In addition, there are 11 ingress points under the Interstate 5, railroad, and utility line (e.g., energy and telephone) easement corridors that run parallel to the coastline and allow access to inland training areas of the Base. However, only one of these ingress points (underpasses) is capable of supporting use by *all* military vehicles, equipment, and personnel, including tanks and other amphibious assault equipment. Other physical constraints to amphibious training exercises include terrain (bluffs), other existing leases and easements (San Onofre Nuclear Generating Station, San Diego Gas & Electric, etc.) and a variety of environmental constraints that include species and habitats, wetlands, nesting sites, and archaeological resources. Each of these constraints restricts military and support activities on Camp Pendleton's beaches during amphibious landings, particularly for larger exercises such as Kernel Blitz, severely degrading Camp Pendleton's military readiness capability.

The majority of amphibious assault training activity occurs at Red Beach. Other amphibious assault training can take place at Green, White, and Blue Beaches; however, each of these has environmental and physical limitations that reduce effectiveness for ingress opportunities. Of

R-2503 C
(15,000 feet - Flight Level 270)

"High Angle Arty Only"

**V-23
AIRWAY ***

(4,000 - 17,000 feet)
(Commercial Airway)

R-2503 B
(15,000 feet)

**Camp Pendleton
Restricted Airspace**

R-2503 A
(2,000 feet)

Pacific Ocean

MCB Camp Pendleton

Not to Scale

Figure 2-3
Regional Aviation Airspace Profile
(Special Use and Restricted)



Map Source:
AC/S Environmental Security
GIS Branch
October 2001



* Heavily used by commercial
and general aviation aircraft.

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the five amphibious landing beaches, Red Beach has the least amount of environmental and physical constraint to training activities.

Maneuver Corridors

Proficiency with the variety of military weapons and hardware used by Marines stationed at Camp Pendleton is crucial to the readiness of the Marine Corps and the military training mission of the Base. A key to developing weapons proficiency is ready access to the various firing ranges spread across the Base's interior, particularly those firing positions located around the perimeter of the Central Impact Area. One of the primary components of accessing interior ranges is the availability of inland transit routes, called "maneuver corridors" Figure 2-4. These maneuver corridors represent key locations where movement of military personnel, equipment and vehicles is facilitated, or at least relatively unrestricted by either terrain, vegetation, man-made constraints (e.g., buildings and developed areas) and/or rigid environmental regulations (e.g., designated Critical Habitat, sensitive species and archaeological locations, wetlands, etc.)

Training Areas

Camp Pendleton's 31 training areas and open space lands facilitate the intensive training mandated by Marines to acquire a full range of basic and advanced combat readiness skills, weapons proficiency, and leadership skills. The Base's natural resources are unique and irreplaceable to the Marine Corps because they combine over 17 miles of coastline and extensive, diverse inland training areas. Camp Pendleton is the only West Coast Marine Corps facility where amphibious training operations can be combined with elements of Marine aviation and other supporting combat arms to develop, evaluate, and exercise Marine Corps combat doctrine to the fullest extent.

Inland training areas consists of nearly 114,000 acres of live-fire ranges, impact areas, and training areas. Camp Pendleton's 31 training areas and ranges are designed to facilitate all phases of combat readiness training - from individual basic warrior (small arms) training to larger company/battalion sized training operations. Even larger live-fire combined arms training evolutions that include the use of artillery and Close Air Support are conducted aboard the Base.

The uniqueness and variety of Camp Pendleton's topography, combined with its contiguous offshore amphibious training areas, its live fire ranges, and its protective restricted airspace, offer maximum flexibility for establishing realistic combat training scenarios. This capability to remain flexible is essential. Camp Pendleton is truly the only complete amphibious training facility in the Pacific region and a precious national asset to be preserved.

2.3.1.2 IMPACT AREAS

Impact areas on Camp Pendleton have been specifically designated for the receipt of live-fire ordnance (projectiles and explosives) and serve as targeting areas for associated live fire

exercises for the various weapons used in training. Locations designated as impact areas cover approximately 33,200 acres of Camp Pendleton. Of this amount, nearly 4,200 acres (including the Range 409 impact area and Firing Ranges 312A, 313A, and 403) overlaps with the training area acreage provided above. Impact areas on Camp Pendleton are classified as either *dud-producing* or *non dud -producing* (Figure 2-4).

Dud-producing impact areas support the delivery of ground-to-ground and air-to-ground ordnance and may contain unexploded (dud) ordnance. Dud-producing impact areas include the Quebec, Whiskey, and Zulu impact areas, often referred to collectively as the Central Impact Area. The CIA contains most of live-fire ranges on Base and, as such, is bordered on all sides by safety zones and the remaining maneuver and training ranges.

Including safety zones and the Jardine Canyon area between Quebec and Whiskey/Zulu, the Central Impact Area totals over 29,000 acres. No maneuver activities are conducted within the CIA. Access to dud-producing impact areas is tightly controlled for safety reasons. Wildfire in these areas is not normally suppressed due to safety concerns. Firebreaks are used to contain wildfires in dud-producing impact areas.

Non dud-producing impact areas, referred to collectively as “secondary impact areas,” support training activities that utilize small arms firing and the use of non dud-producing ordnance in live fire exercises. Secondary impact areas are scattered across the Base and include Edson Range, X-Ray Impact Area, 409 Impact Area, and Firing Ranges 312A (currently inactive), 313A (currently inactive), and 403 located within the Juliett Training Area (Figure 2-4). Upon request, maneuver activities may be conducted within secondary impact areas.

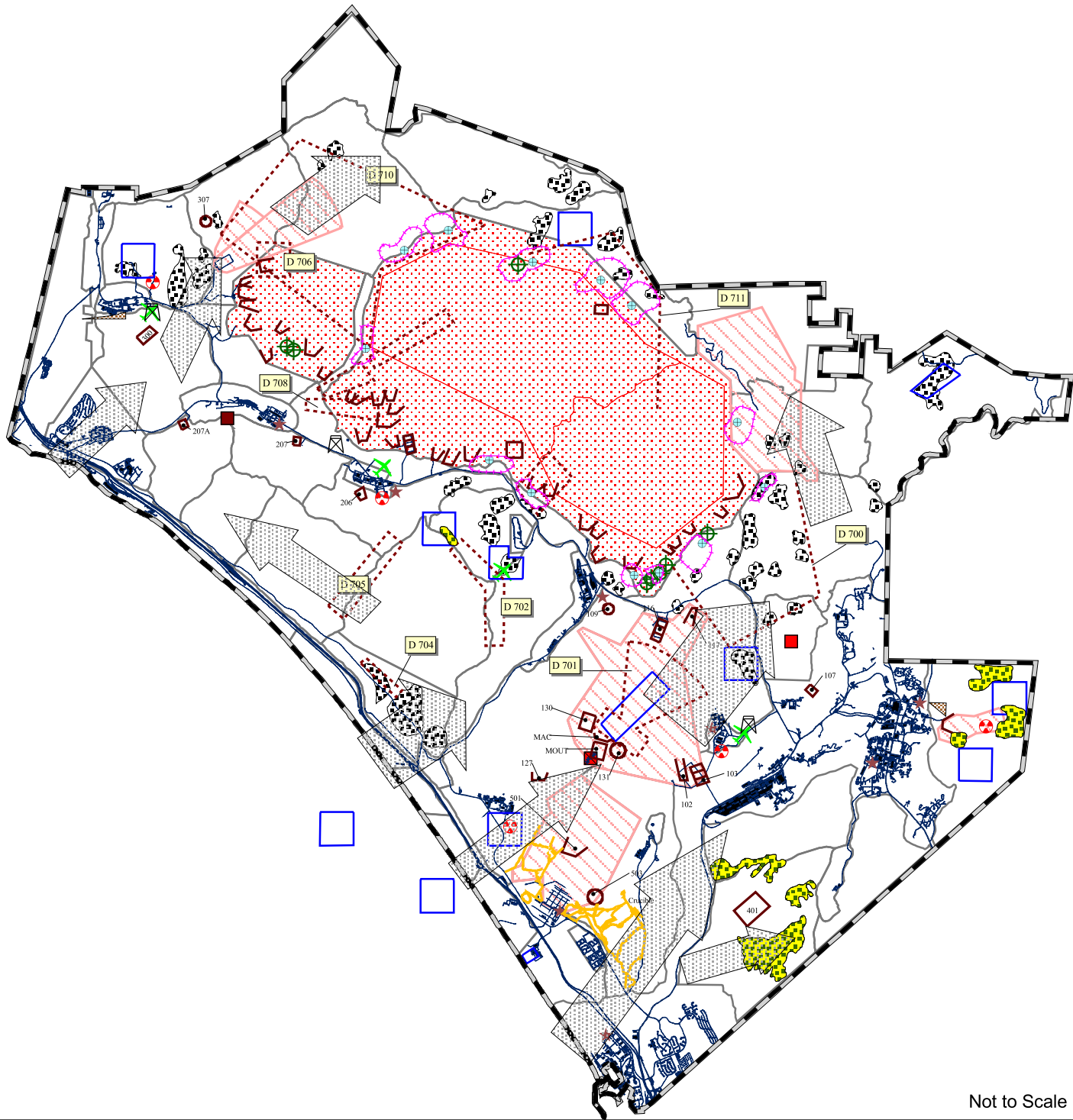
2.3.1.3 TRAINING SUPPORT FACILITIES

Camp Pendleton has numerous training related facilities to support the diverse sea, and land based training. These facilities range from combat training towns and rappel towers to designated areas for the use of live fire, explosives, and other potentially hazardous training. Training facilities in support of aviation operations are discussed in Section 2.3.1.4 below.

Live Fire, Explosives, Blanks, Pyrotechnics, Smoke, Chemical Munitions, and Lasers

Live fire is defined to include the use of weapons or weapon systems that produce projectiles (e.g., small arms, artillery, aviation ordnance, and other dud- and non dud-producing ordnance). For ease of coverage in this document, live fire does not include explosives, pyrotechnics, and other incendiary devices.

Training operations which involve the use of live fire are restricted to the following six types of locations across the Base (Figure 2-4): impact areas (described above); live fire facilities, including ranges, Artillery Firing Areas (AFAs), Mortar Positions (MPs), and Mortar Firing Areas (MFAs); and Live Fire And Maneuver (LFAM) areas. The Base currently operates nearly 100 live fire facilities and 12 LFAM areas.



Not to Scale

Figure 2-4
Ground Training Operations

- | | | | |
|--|--|--|---------------------|
| | Camp Pendleton Boundary | | NBC Facilities |
| | Training Area Boundaries | | 25 Area Combat Town |
| | LFAM | | 52 Area Combat Town |
| | Crucible | | MOUT |
| | Firing Ranges | | Maneuver Areas |
| | Mortar Firing Areas | | |
| | Heavy Equipment Training Sites | | |
| | AFAs | | |
| | Live Fire Impact Areas (Non-Dud Producing) | | |
| | Central Impact Area (Dud Producing) | | |
| | Dropzone | | |
| | RSOPs (NFAFAs) | | |
| | Rappelling Towers | | |
| | Obstacle Courses | | |
| | Mortar Positions | | |
| | Aircraft Mock-Ups/Hulks | | |



Map Source:
AC/S Environmental Security
GIS Branch
October 2001



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A live fire range is a designated area equipped with a variety of targets and monitoring/scoring devices for live fire training. Live fire ranges are designed to accommodate a broad spectrum of weapons including pistols, rifles, machine guns, mortars, antitank assault weapons, grenades, missiles, and artillery. These include man-portable weapons, vehicle-mounted weapons systems, and rotary and fixed wing aircraft systems. Ranges are designed to provide combat conditions and scenarios to train personnel as well as test the capabilities of weapon systems. Live fire ranges must be continuously upgraded to keep pace with evolving technology. With few exceptions, the firing ranges are located within and along the perimeter of the central and secondary impact areas.

AFAs, MPs, and MFAs are designated locations for the firing of inert and explosive artillery and mortar ammunition into the impact areas. The Base currently has 45 AFAs and 7 MPs. Twelve MFA sites are proposed within the periphery of the Central Impact Area. AFAs are fairly large and relatively flat areas, usually free of brush and shrubs. MPs are similar, but much smaller in area. The proposed MFA sites are generally larger than MPs and are for simulating emergency suppression tactics. Specially designated AFAs are also used in conjunction with live fire operations by wheeled and tracked assault vehicles. AFA or MP training includes the burning of unused powder and charges. This is generally conducted in trenches and in accordance with the Range and Training Regulations, equipment technical manuals and operation manuals. There are six nonfiring AFAs on Base, called Reconnaissance, Selection, Occupation of Positions (RSOPs) that are used for AFA types of training without live fire. RSOPs are also included in Figure 2-4 as they receive the similar types of training related impacts (less the firing noise and associated impacts) as AFAs.

With few exceptions, MPs are located within and along the perimeter of the central and secondary impact areas; the AFAs, RSOPs, and LFAM areas are located in training areas throughout the Base.

Live Fire and Maneuver activities are field training exercises that practice the coordination of infantry, vehicle, flight operations, and combat service support operations during various offensive assault and attack scenarios. LFAM operations enable personnel to experience realistic simulations of combat scenarios. Twelve specific locations on Base designated for LFAM operations (Figure 2-4):

- D700 occupies an area that overlaps portions of several training areas, including India, Kilo One, Kilo Two, and the CIA buffer. This LFAM site has been selected to accommodate battalion sized or larger units in mobile assaults scenarios that integrate infantry, aviation, mechanized, and motorized units with direct live fire and supporting arms live fire.
- D701 occurs primarily within the X-Ray Impact Area. This LFAM site has been selected to integrate battalion sized or larger infantry and mechanized, aviation, and motorized assault units with scenarios that include minefield breaching operations and both direct live fire and supporting arms live fire.
- D702 occupies a small canyon situated in overlapping portions of three training areas: Papa One, Two, and Three. This LFAM has been selected to integrate company and

platoon sized or smaller infantry assault units with live fire and maneuver scenarios that include use of both direct live fire and supporting arms live fire.

- D703 primarily occupies lands within the CIA, northeast of Basilone Rd. across from the ASP facility, including a portion of AFA#10. This LFAM has been selected to integrate company and platoon sized or smaller infantry assault units within live fire and maneuver scenarios that include both direct live fire and supporting arms live fire.
- D704 occupies an area that lies exclusively within the Tango training area, overlapping with a portion of AFA#14, east of I-5. This LFAM has been selected to integrate company and platoon sized infantry maneuver activities within scenarios that include direct live fire. This LFAM will also integrate mechanized unsupported live fire and maneuver attacks.
- D705 occupies a portion of Horno Canyon that includes parts of several training areas: Papa Two, and Romeo One and Two. This LFAM site has been selected to accommodate company and platoon sized mobile assault scenarios that integrate both mechanized and motorized units in live fire offensive attacks.
- D706 is primarily situated within a portion of the Quebec Impact area but also includes portions of the Bravo One and Yankee training areas. This LFAM site has been selected to support platoon sized or smaller infantry assault units within a live fire ambush scenario.
- D707 is exclusively situated within the CIA, near Jardine Canyon. This LFAM site has been selected to support squad sized infantry units within an offensive range live fire scenario.
- D708 is primarily situated along a hillside overlooking the south fork of San Onofre Canyon, east of the 52 Area, near Jardine Canyon. This LFAM site has been selected to support squad sized infantry units conducting live fire assault scenarios.
- D709 is primarily situated along the drainage within the north fork of San Onofre Canyon, east of Jardine Canyon. This LFAM site has been selected to support aerial assaults on a mechanized enemy column using anti-armor weapons systems.
- D710 occupies a larger region of the northern part of the Base, overlapping portions of several training areas: Bravo One, Charlie, Yankee, Quebec Impact Area, and the northernmost reaches of the CIA, including Jardine Canyon. This LFAM site is designated as Live Fire And Maneuver Area #4 and has been selected to accommodate company and platoon sized units in mobile assault scenarios that integrate infantry, units with direct fire, and aerial support live fire, including the use of ordnance.
- D711 is primarily situated along the eastern margin of the CIA, adjacent to Echo Training Area, but also includes portions of the Whiskey-Zulu Impact Areas and its adjoining buffer zone. This LFAM site has been selected to support company sized

units in helicopter insertion of heavy weapons and coordinated live fire attacks in an offensive scenario.

Except for hand grenade training, use of explosives are limited to demolition training and to simulate battlefield conditions. Typical explosive devices involve trinitrotoluene (TNT), C4, shape charges, 1700-pound line charges, and demolition equipment. Demolition and explosives training involving ¼-pound blocks of TNT and C4 or smaller may be used on all ranges and training areas (or wherever a unit commander believes is safe, so long as usage complies with the fire danger rating and Base Order restrictions). Larger charges are permitted on ranges 219, 401, and 600 but require proper approvals for use on any other range or training area. Hand grenade training is restricted to ranges 109, 202, 307, and 503.

Blanks are non-projectile producing rounds that may be used with an array of small arms to simulate weapons firing without the safety risks involved with the use of live ammunition. Blanks may be used basewide in all training areas, so long as usage complies with the fire danger rating and Base Order restrictions.

Pyrotechnics are devices that create smoke and/or light for signaling or illumination (e.g., flares or smoke grenades) or for simulating battlefield conditions. Some devices are designed to produce smoke for targeting or for “self-screening” that are not typically considered pyrotechnics (e.g., white phosphorous, used largely for targeting, is not considered a pyrotechnic in the Range and Training Regulations manual). Pyrotechnics and smoke producing devices are permitted in training areas throughout the Base, so long as usage complies with the fire danger rating and Base Order restrictions.

Chemical munitions used during infantry training refer almost exclusively to nontoxic tear gas (chlorobenzylmalononitrile), which is used in designated nuclear, biological, and chemical (NBC) chambers, in Combat Training Towns, the Military Operations in Urban Terrain (MOUT), and throughout training areas in general (Figure 2-4).

Camp Pendleton has been certified for the use of a variety of man-portable, vehicle-mounted, and airborne laser targeting systems generally employed in target designation in ranges and impact areas. Laser systems may be operated only from observation posts and live fire ranges as specified in the Range and Training Regulations (paragraph 8005).

Obstacle Courses, Rappelling, Urban Terrain, etc.

The Base has a variety of facilities for ground based training exercises (Figure 2-4). These include, but are not limited to: two Combat Training Towns (CTTs, one each in Kilo Two and Alfa Two training areas), one MOUT (in X-Ray impact area), 19 obstacle courses, the Crucible course, 3 rappel towers, aircraft mock-ups (Hulks), and two heavy equipment training sites (discrete locations for bulldozer, etc. training).

The CTTs and the MOUT are facilities that simulate developed areas for urban terrain training and consist of one and two story concrete block and wood buildings to simulate infiltration, patrolling of built-up areas, building searches, etc. The 25 Area CTT (in Kilo Two), 52 Area

CTT (in Alfa Two), and the MOUT occupy approximately 62, 48, and 312 acres respectively (acreage estimates include ruderal land surrounding the facilities). Training conducted in the 52 Area CTT employs only small arms blanks and smoke grenades, whereas the combat scenario at the 25 Area CTT is further enhanced by the use of simulated artillery and machine gun fire (from propane cannons), tear gas, additional smoke devices, and pyrotechnics. In addition to the kinds of activities conducted at the CTTs, training at the MOUT involves detonation of ¼-pound TNT charges and use of six live fire stations situated at Range 131, all located within the X-Ray Impact Area.

2.3.1.4 AVIATION OPERATIONS

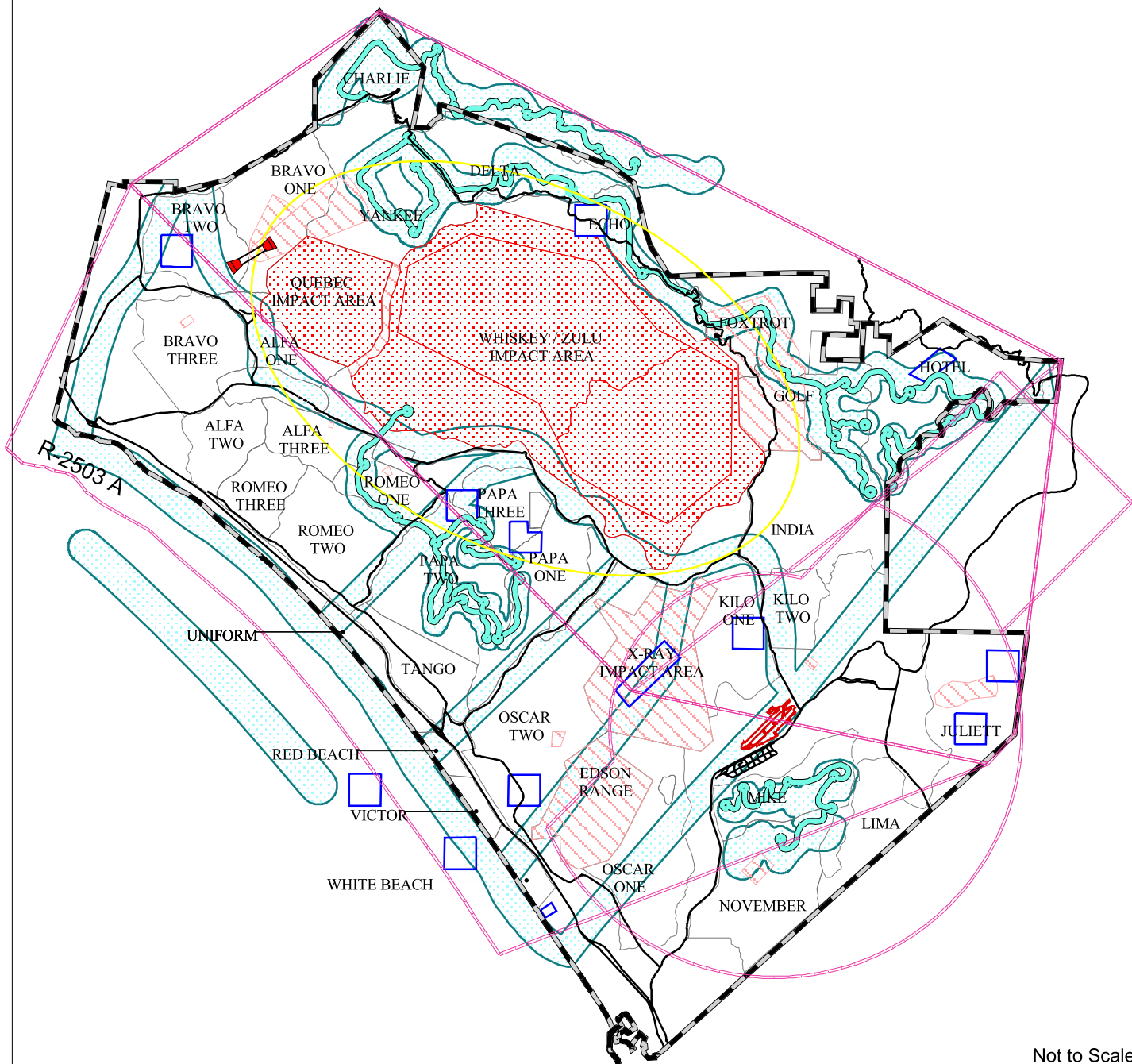
Camp Pendleton's Special Use Airspace includes military operations areas, a controlled firing area, and restricted airspace established to support military training and ground weapons firing per agreement with the Federal Aviation Administration (FAA). This Special Use Airspace is approved for military use from 6:00 AM to midnight, seven days a week, year around (Figure 2-5).

Special Use Airspace was established over Camp Pendleton to segregate hazardous military air operations and ground firing activities from nonparticipating civil aviation operations. The restricted airspace overlies most of the Base's landmass, including all of its inland training ranges. As many as five unlawful intrusions into Camp Pendleton's airspace occur each month from private civilian aircraft, raising the potential for collision. MCAS Camp Pendleton, with eight helicopter squadrons, 180 aircraft, and over 148,000 flight operations annually on a single runway, is the busiest helicopter airstrip in the Marine Corps (at peak periods, a military aircraft, usually a helicopter, takes off or lands at MCAS Camp Pendleton within the R2503-B airspace every two minutes). Adding to the situation, the commercial airway (V-23) located just off the coast from Camp Pendleton is considered the busiest in southern California. At peak periods, a commercial aircraft operates in this airspace every two minutes, as well. This situation has led the FAA to designated Camp Pendleton as a "High Midair Potential" area.

Commercial air traffic from the 40 airports within a 60-mile radius of Camp Pendleton severely degrades aviation training and adversely affects overall military readiness at Camp Pendleton. Requirements exist for expanding restricted airspace to support new warfighting tactics and equipment (e.g., MV-22 Osprey, multiple rocket artillery system, etc.).













Nearly 4,000 personnel and 180 rotary wing aircraft are stationed at MCAS Camp Pendleton. Rotary wing aircraft participating in flight operations on Base include the Huey (UH-1), Cobra (AH-1W), Sea Knight (CH-46E), Super Stallion (CH-53E), and Sea Stallion (CH/RH-53D). Additionally, rotary wing aircraft from Marine Corps Air Station Miramar and local Navy installations and ships, Coast Guard stations, the Air Force Bases, and Army facilities utilize the Central Impact Area and the various landing areas located across the Base.

Rotary wing operations include: ordnance delivery (e.g., rockets, gunnery), air-launched anti-armor missile training, night vision goggle training, parachute drops of supplies and personnel, vertical replenishment (VERTREP), from ship-to-shore and shore-to-ship operations, external load training, door gunner training, Low Altitude Antiaircraft Defense (LAAD) training, and



Not to Scale

**Figure 2-5
Aviation Operations
(Airspace)**

-  Camp Pendleton Boundary
-  Training Area Boundaries
-  Camp Pendleton Special Use Airspace
-  Main Roads
-  MCAS Camp Pendleton (23 Area Air Station)
-  Fixed Wing Close Air Support (CAS) Route
-  TERF Routes
-  HOLF
-  Central Impact Area (Restricted Access)
-  Live Fire (Non Dud-Producing) Impact Areas
-  Aviation Overflight Zones
-  Drop Zone



Map Source:
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Terrain Flight (TERF) route operations (Figure 2-5). Rotary wing training operations typically utilize aviation overflight zones (Figure 2-5) and five live fire ranges located in the dedicated impact areas of the Base. Helicopters also use the door gunner ranges (Door Gunner #1 and Door Gunner #2 ranges) located adjacent to Case Springs, which involves firing machine guns into the Whiskey impact area. Takeoffs and landings are conducted primarily from established landing zones (LZs), Confined Area Landing (CAL) sites, Vertical/Short Take Off and Landing (V/STOL) pads, the Helicopter Outlying Landing Field (HOLF) and simulated amphibious assault ship flight decks (LHA Pads) (Figure 2-6). However, helicopters may take off and land virtually anywhere within training areas, as required by individual training scenarios.

Rotary wing flight operations are typically conducted 100-700 feet above ground level (AGL), depending upon the training scenario and the number of aircraft involved. TERF routes afford aircraft low altitude (50-100 ft AGL) navigation training through passes, canyons, flat terrain, and along rivers. Aviation live fire training events are restricted to the dedicated impact areas. Aviation operations, fixed and rotary wing occur year-round at the Bases various aviation facilities.

The Base recently completed construction of the HOLF (Phase 1) at Range 313A. This facility became operational August 2000 and supports night vision goggle operations, increased helicopter training efficiency (e.g., by providing both grass strip and hard surface runways for skid-mounted, as well as wheeled helicopters), and enhances combat readiness for helicopter squadrons (Ogden 1998).

At present, no fixed wing aircraft are permanently stationed at MCAS Camp Pendleton. Fixed wing turbo prop and jet aircraft from MCAS Miramar and other local military facilities, however, use the Central Impact Area and the various landing areas located across the Base. Fixed wing aircraft participating in flight operations on Base include the Harrier (AV-8), Thunderbolt (A-10), Hornet (F/A-18), Tomcat (F-14), Viking (S-3), Orion (P-3), Hercules (C-130), Star Lifter (C-141), Greyhound (C-2), and numerous aircraft of civilian design/manufacture.

Flight operations involving fixed wing aircraft include: Close Air Support (CAS), command and control, air reconnaissance, transport of troops and equipment, parachute operations for the deployment of personnel and equipment, vertical and short take off and landings, and LAAD training. Fixed wing ground support aircraft, with the exception of AV-8Bs, confine their take off and landing operations to the air station. AV-8Bs can perform takeoffs and landings at the V/STOL pad located south of Red Beach, the LHA pad in the Tango Area, the V/STOL Two pad in the Oscar Two Area, and the designated Road Operations area on old Highway 101 east of I-5 in the Tango area (Figure 2-6). Parachute operations occur within designated Drop Zones (Figure 2-6). Fighter and attack aircraft conduct CAS activities with live and inert ordnance in the Zulu Impact Area located in the center of the Base (Figure 2-6). Simulated CAS in support of ground maneuver operations may occur within all training areas.

2.3.2 Base Infrastructure and Mission Support

Camp Pendleton's military training mission is sustained by a wide range of mission support activities and facilities. Similar to local municipalities, the Base provides Marines, Sailors, and their families with support facilities and services, including housing, water and sewage service, solid waste disposal, medical and dental services, schools, child care, employment assistance, and recreation opportunities. The importance of providing this support in close proximity to training areas cannot be understated.

The Base is home to as many as 41,000 residents: 18,000 single service members, 6,000 married service members, and another 17,000 family members. In addition, almost 10,000 civilian workers (e.g., San Onofre Nuclear Generating Station, DoD, State Parks, etc. personnel) transition on and off Base each day.

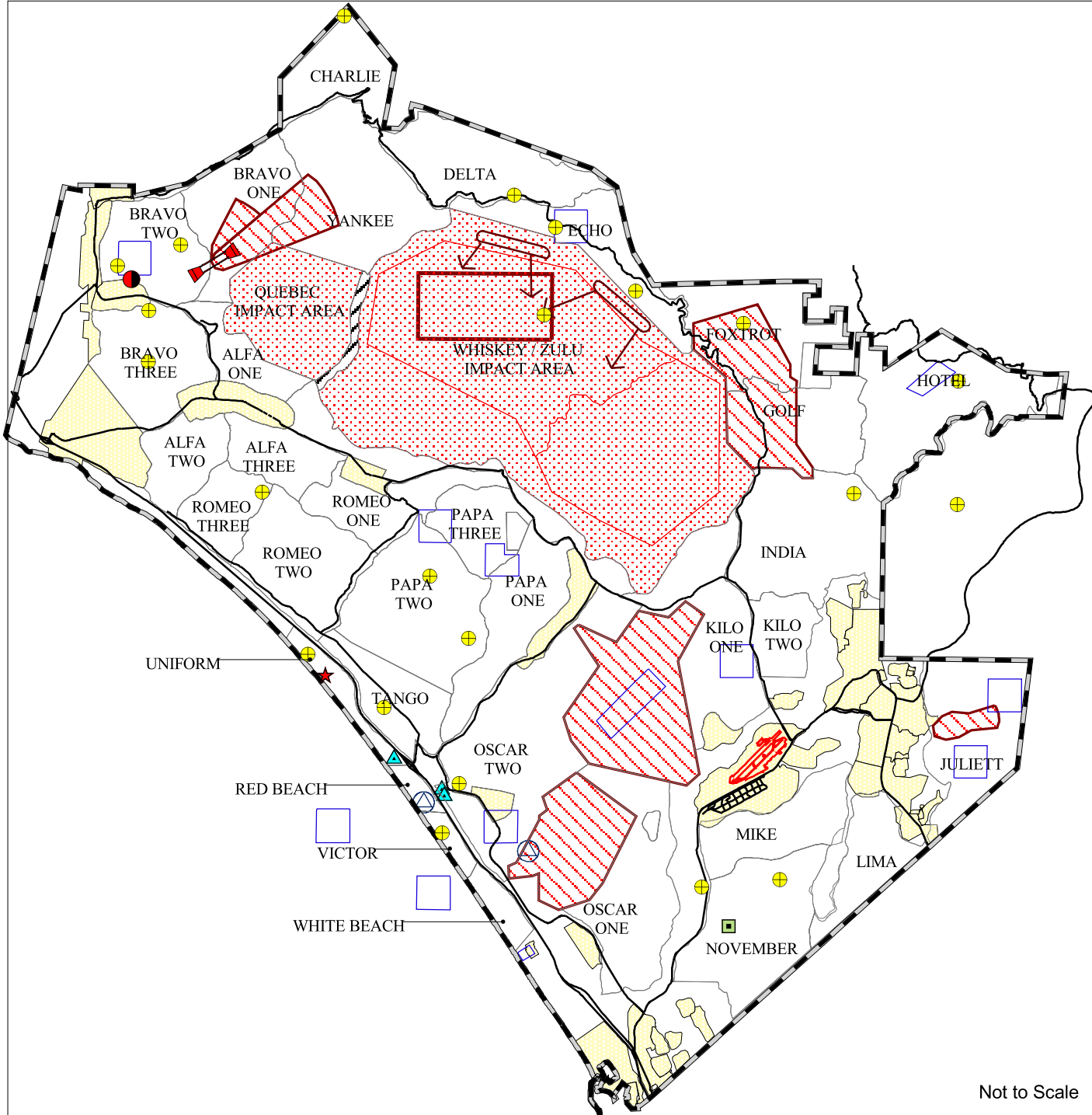
Camp Pendleton currently has more than 5,000 buildings and structures, 500 miles of roads, and nearly 1,000 miles of utility lines basewide (Figure 2-7). The estimated current value of land and physical assets is over \$2.9 billion, not including military hardware and personnel. These assets are located on approximately 10,000 acres (cantonment areas) scattered across the Base in pockets of development. Much of the infrastructure development of Camp Pendleton over its nearly 60 year history has occurred on lands previously disturbed by cattle ranching and farming activities that covered approximately 82,500 acres of the former *Rancho Santa Margarita y Las Flores*.

2.3.2.1 CANTONMENT AREAS

Cantonment areas are portions of the Base that generally contain infrastructure development (Figure 2-2), including more than 5,000 buildings and other permanent structures. Cantonment areas are designated on Base maps, however, some portions of designated cantonment areas contain open space and may be used for training, recreation, etc. Likewise, designated training areas may contain some buildings and infrastructure development. Areas designated as cantonment total approximately 10,800 acres. Sometimes included in the acreage designated as cantonment are a cultural resource area (*Estancia de las Flores*) and/or the golf course, adding 180 acres and 380 acres, respectively, to the cantonment total. Actual developed areas on Base, not including roads, are estimated to total 9,800 acres.

Seven separate cantonment areas for infantry and artillery regiments and schools are located along Basilone and San Mateo Roads, namely San Mateo, San Onofre, Horno, Las Pulgas, Margarita, Vado Del Rio, and Talega. Two cantonment areas, Las Flores and Edson Range, are located on the coastal plain east of I-5 and three other cantonment areas, Del Mar, MCTSSA, and Assault Craft Unit 5 are located on the coastal plain west of I-5.

The largest concentration of development is in the southeastern corner of the Base, close to Fallbrook and San Luis Rey gate, where major community support facilities and four family housing areas are located. The U.S. Naval Hospital, another family housing area, Chappo industrial area, and MCAS Camp Pendleton lie in the Santa Margarita River valley.



Not to Scale

- Camp Pendleton Boundary
- Training Area Boundary
- Main Roads
- Drop Zone (DZ)
- Central Impact Area (Dud-Producing)
- Live Fire Impact Areas(Non Dud-Producing)
- Aircraft Strafing Range
- Cantonment
- Helicopter Outlying Landing Field (HOLF)
- Vertical/Short Take Off and Landing (V/STOL)
- Confined Area Landing Site (CALS)
- Helicopter Heavy Lift Pad (HLZ)
- Helicopter Doorgunner Range
- LHA Pad
- TALA
- VERTREP

Figure 2-6
Aviation Operations
(Facilities)



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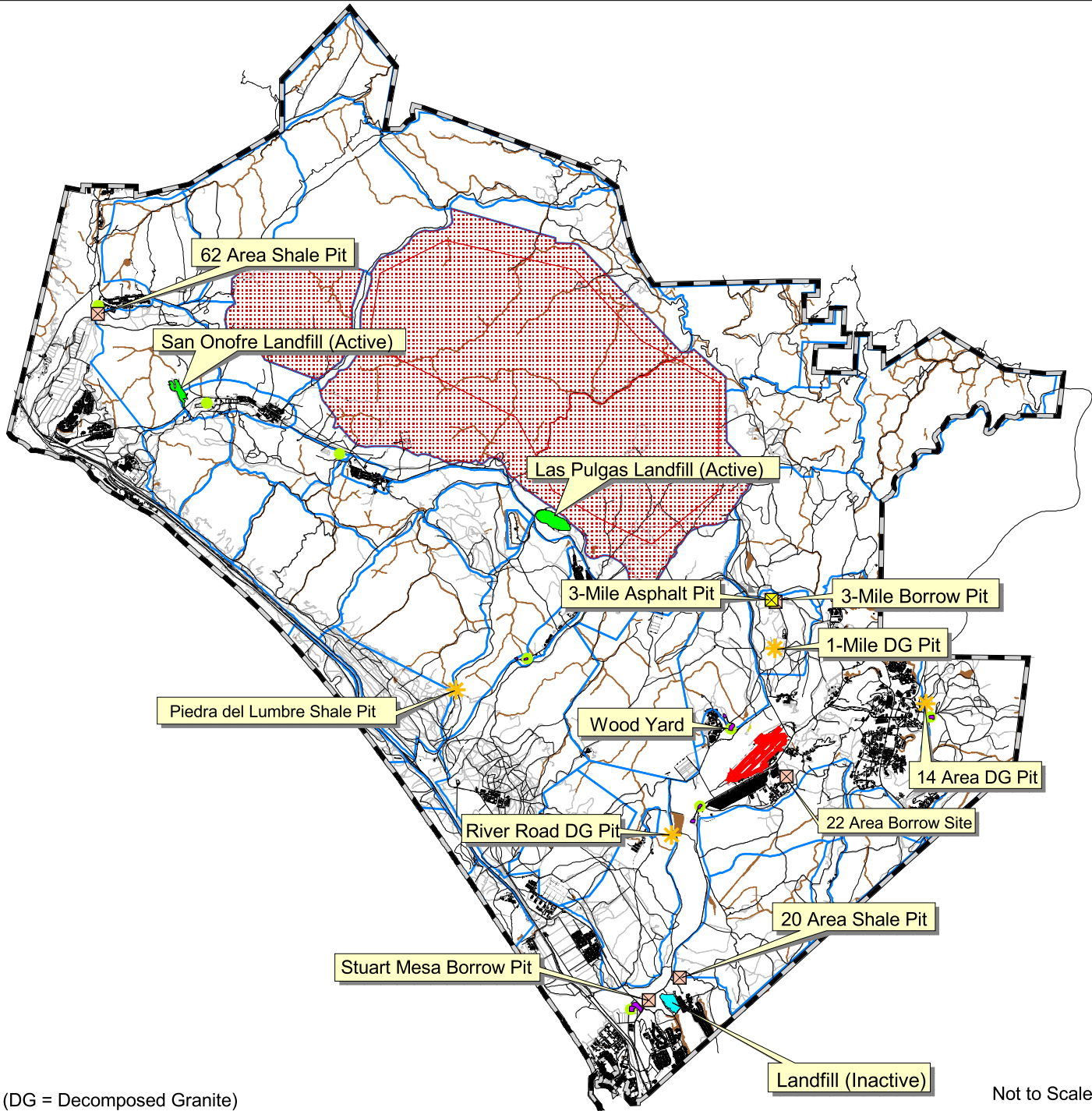


Figure 2-7
Camp Pendleton Support Facilities

- Camp Pendleton Boundary
- Training Area Boundary
- Unimproved (Dirt) Roads
- Firebreaks
- MCAS Camp Pendleton
- Central Impact Area
- Buildings, Roads and Parking Areas
- Recycle Facility
- Wastewater Treatment Facility
- Inactive Borrow Site
- Active Borrow Site
- Active Asphalt Pit



Map Source:
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The second largest concentration of development occurs in the southwestern corner of the Base. Wire Mountain, the largest family housing area, is located just east of I-5 at the Oceanside Gate. The Del Mar boat basin and additional family housing lie to the west of I-5. A large family housing community (1,166 units), Stuart Mesa housing, is south of Edson Range. Another family housing area and a shopping center are located near the San Onofre gate at the northwestern corner of the Base. The San Mateo Point family housing area contains 76 attached residential units.

2.3.2.2 RECREATION AREAS

The Base recreation program provides a variety of recreational opportunities to Base patrons, including members of the public. Chapter 5 identifies the locations of recreational opportunities on Base, as well as the extent of public access for the purpose of fish- and wildlife-oriented recreation/education. Many recreational activities occur in cantonment areas (e.g., fitness centers, bowling, and cinemas), on roads or trails (jogging, bicycling), or training areas (hunting, camping). Few areas on Base are dedicated solely for recreational purposes. These are the equestrian facilities (stables, rodeo grounds, horse pastures [1,309 and 123 acres]) and the golf course (380 acres). Although primary purpose of Lake O'Neill is as an aquifer recharge, the lake also provides recreational opportunities for fishing, camping, boating, and the like. Even the State Park is not solely devoted to recreational usage as it is also available for training operations with prior coordination.

2.3.2.3 ROADS, TRAILS, FIREBREAKS, ETC.

Primary and secondary roads, parking lots, and culverts are widely distributed across the Base (Figure 2-7). Primary roads consist of paved and improved roads, while secondary roads are dirt roads with decomposing granite, gravel, or shale as a surface covering. Approximately 103 secondary roads exist. The Base has more than 500 miles of roadways. In addition, the Base has established an extensive network of 85 firebreaks and 1 fuel break (MCB Camp Pendleton 1998), totaling nearly 1,300 acres and covering approximately 186 linear miles. A firebreak is any natural or constructed barrier bladed or disked to bare earth and used to segregate, stop, and control the spread of fire. A fuelbreak is a natural or constructed barrier that includes mowed or modified vegetation and is used to segregate, slow, and control the spread of fire or provide a control line from which to work. Fuelbreaks are wider than firebreaks and are not designed to completely stop a fire like a firebreak; rather fuelbreaks allow more time for the fire's heat to dissipate before reaching the firefighter.

2.3.2.4 BORROW SITES, LANDFILLS, AND WOOD YARD

The Base Facilities Maintenance Division operates 6 active borrow sites (Figure 2-7): 20 Area Shale Pit, 62 Area Shale Pit, Stuart Mesa Borrow Site, 22 Area Chappo Site, Three Mile Concrete/Asphalt Site, and the Three Mile Decomposed Granite Pit. An additional 4 borrow sites are inactive: the Piedra de Lumber Shale Pit and the River Road, 14 Area, and One Mile Decomposed Granite Pits. Borrow sites are used at various times for excavation of fill material

for construction projects and maintenance actions, such as the extraction of shale material for use in resurfacing and repairing secondary roadways and unpaved parking lots.

Camp Pendleton also operates and maintains two active landfills for the acceptance, disposal, and daily capping of non-regulated solid waste generated on Base (Figure 2-7): the Las Pulgas and San Onofre landfills. A third landfill site, the Box Canyon Landfill, is currently inactive and is in process of final cap and closure.

The wood yard is a central staging area for woody debris (e.g., tree stumps, logs, limbs), not to include leaf matter, green waste, or lumber/scrap wood. The woody debris within the wood yard is generated from maintenance and construction projects and provides a source of firewood for military personnel.

2.3.2.5 UTILITY LINES AND FENCING

Underground and aboveground utility lines are located throughout the Base. Utility repair is conducted on an emergency basis only and may occur during the day or night. Operational checks and preventive maintenance are conducted throughout the year and typically during daylight hours.

Underground utility maintenance for the repairs and/or upgrading of systems is uncommon and may require excavation of buried utility lines. Maintenance of utilities accessible through manholes, however, only results in ground disturbance from off-road vehicle operation to remote sites. If digging is necessary to gain access to underground utilities, notification of a locator service is required. Equipment used during underground utility maintenance activities ranges from lightweight trucks to heavy trucks and backhoes. Backhoes are frequently used.

Aboveground telephone and fiber optic cables typically follow major roads throughout Camp Pendleton. Periodic herbicide application and vegetation cutting is required to maintain access to the cables and to protect them from overgrowth. Tree trimming is continuously required to protect overhead lines from damage. Herbicides are applied and vegetation is cleared around the base of telephone poles and pedestals in a 10-foot radius. Pipeline maintenance activities for aboveground pipelines include routine examinations for leaks and deterioration, operational inspections, and preventive maintenance. Herbicides are applied with a backpack spray system and hand tools. Weed eaters, swing blades, and hand-held trimmers are used to cut vegetation. Lightweight vehicles are commonly used in routine maintenance and repair activities.

The majority of fences on Base are chain link; however, there are also some barbed wire and wood fences. Fences are concentrated in developed areas and around facilities, with additional fencing on some portions of the Base boundary and some range boundaries. Most fence maintenance involves minor repairs on existing fence lines and requires only the use of lightweight trucks, hand tools, and augers. Fence maintenance is conducted on an as-needed basis, typically during daylight hours.

2.3.2.6 POTENTIALLY CONTAMINATED SITES

There are 62 locations (Figure 2-8) on Camp Pendleton that have been identified as sites where the disposal or discharge of hazardous wastes may have resulted in potential environmental contamination. Once identified, these sites are researched, investigated and remediated through the Camp Pendleton Installation Restoration (IR) program. The IR program is designed to comply with procedural and substantive requirements of the Comprehensive Environmental Response, Compensation, and Liability Act, the Superfund Amendments and Reauthorization Act (SARA), with regulations promulgated under these Acts and other relevant federal and state laws including the Endangered Species Act.

Contamination at Camp Pendleton has primarily resulted from past waste disposal practices, many of which are no longer accepted (due to the evolution of environmental regulatory guidelines). These wastes resulted from Base operations, such as maintenance and repair of trucks, tanks, and aircraft. Vehicle fluids and solvents have been the principal wastes generated on Base. Camp Pendleton has grouped its 62 locations into five operable units based on similarities such as the types of environmental issues, selected cleanup methods, and/or geographic location (see Table 2-1). Appendix J provides the status of these sites and a description of sites still undergoing evaluation or remedial action.

As required by CERCLA, Section 120 (e), Camp Pendleton has developed and signed a Federal Facilities Agreement (FFA) with the Environmental Protection Agency (EPA) and the State of California for the management, conduct and approval of the cleanup process. The Camp Pendleton FFA established a FFA management team consisting of the EPA; San Diego Regional Water Quality Control Board, California Department of Toxic Substances Control, Southwest Division, Naval Facilities Engineering Command (SWDIV); and Camp Pendleton for the purpose of ensuring all "applicable or relevant and appropriate requirements (ARAR)," such as Federal, state, and local standards (including those for protection of sensitive species), are taken into account, and establishing schedules and remedial actions to be taken.

CERCLA and EPA guidance further requires that regulatory agencies and the public be informed of the results of studies and investigations as they occur and that their input is sought at certain stages of environmental investigation and cleanup work, for example, upon completion of draft feasibility studies, remedial action plans/proposed plans or their equivalent. To ensure that EPA, resource agencies, appropriate state and local officials and the general public are provided adequate opportunity to review and comment on assessments/studies and proposals, Camp Pendleton has implemented a proactive public information program and established a Technical Review Committee. Formal public comment periods of at least 30 days have been and will continue to be held as required and will be announced through fact sheets and published notices in the *San Diego Union-Tribune*, *Scout*, and *North County Times*. Following each public comment period, a responsiveness summary will be prepared to document the DoN's responses to significant public comments and explain how public comments have been addressed.

Table 2-1. Camp Pendleton operable units and Installation Restoration (IR) program sites. ¹

Operable Unit	Site Number	Name (Affected Medium)	ROD Completed
OU-1	4	Marine Corps Air Station Drainage Ditch (soil)	Yes (12/95)
	4A	Marine Corps Air Station Concrete-Lined Surface Impoundment (soil)	Yes (12/95)
	9	Stewart Mesa Waste Stabilization Pond in 41 Area (soil, groundwater)	Yes (12/95)
	24	Morale, Welfare and Recreation Maintenance Facility in 26 Area (soil, groundwater)	Yes (12/95)
OU-2	2B	Grease Disposal Pit in 32 Area (soil, groundwater)	Yes (9/97)
	3	Pest Control Wash Rack (soil, groundwater)	Yes (9/97)
	5	Firefighter Drill Field (soil, groundwater)	Yes (9/97)
	6	DPDO (DRMO) Scrap Yard and Bldg. 2241 (soil)	Yes (9/97)
	8A	Las Pulgas Landfill and Las Flores Creek (soil, groundwater)	Yes (9/97)
	19	ACU-5 (LCAC) Surface Impoundments in 31 Area (soil, groundwater)	Yes (9/97)
	20	Las Pulgas Vehicle Wash Rack in 43 Area (soil, groundwater)	Yes (9/97)
	22	Unlined Surface Impoundment in 23 Area (soil, groundwater)	Yes (9/97)
	28	Trash Hauler's Maintenance Area in 26 Area (groundwater)	Yes (9/97)
	31	Bldg. 210801 Transformer (soil, groundwater)	Yes (9/97)
	43	Santa Margarita Basin Groundwater Study (groundwater)	Yes (9/97)
	44	Santa Margarita Basin Surface Water & Sediment Study (surface water, sediment)	Yes (9/97)
	45	Santa Margarita Coastal Wetland Study (soil, groundwater, sediment)	Yes (9/97)
OU-3	1A	Refuse Burning Ground in 14 Area (soil, groundwater)	No
	1B	Refuse Burning Ground in 11 Area (soil, groundwater)	Yes (3/99)
	1C	Refuse Burning Ground in 1.3 Area (soil, groundwater)	Yes (3/99)
	1E	Refuse Burning Ground in 32 Area (soil, groundwater)	Yes (3/99)
	1F	Refuse Burning Ground in 43 Area (soil, groundwater)	Yes (3/99)
	1I	Refuse Burning Ground in 63 Area (soil, groundwater)	Yes (3/99)
	2A	Grease Disposal Pit in 14 Area (soil, groundwater)	Yes (3/99)
	2C	Grease Disposal Pit in 33 Area (soil, groundwater)	Yes (3/99)
	2D	Grease Disposal Pit in 43 Area (soil, groundwater)	Yes (3/99)
	2E	Grease Disposal Pit in 53 Area (soil, groundwater)	Yes (3/99)
	2F	Grease Disposal Pit in 62 Area (soil, groundwater)	Yes (3/99)
	2G	Grease Disposal Pit in 31 Area (soil, groundwater)	Yes (3/99)
	7	Box Canyon Landfill (soil, groundwater)	No
	10	Sewage Sludge Composting Yard in 26 Area (soil, groundwater)	Yes (3/99)
	16	Bldgs. 22151 and 22187 Ditch Confluence and Ditch in 22 Area (soil)	Yes (3/99)
	17	Bldg. 22187 Marsh and Ditch in 22 Area (sediment, surface water)	Yes (3/99)
	18	Bldg. 1687 Spill and Ditch in 13/16 Area (soil, groundwater)	Yes (3/99)
	27	Ditches Behind Bldg. 22210 in 22 Area (soil)	Yes (3/99)

Table 2-1. Continued.

Operable Unit	Site Number	Name (Affected Medium)	ROD Completed
	32	Drum Storage Area and Drainage Between Bldgs. 41303 and 41366, (soil, groundwater)	Yes (3/99)
	34	Combat Engineers Maintenance Facility, Bldgs. 62580-62583 (soil, groundwater)	Yes 3/99)
	35	Former Sewage Treatment Plant Facility in 25 Area (soil, groundwater)	Yes (3/99)
	36	Debris Pile Area Behind Ponds at Sewage Treatment Plant II (soil, groundwater)	Yes (3/99)
	37	Pesticide and POL Handling Areas at San Clemente Ranch (soil, groundwater)	Yes (3/99)
	38	Sewer Line, Bldg. 52188 in 52 Area (soil, groundwater)	Yes (3/99)
	39	Sewer Line, Bldgs. 41300 and 41346 in 41 Area (soil, groundwater)	Yes (3/99)
	40	Sewer Line, Bldg. 13103 in 13 Area (soil, groundwater)	Yes (3/99)
	41	Sewer Line, Bldg. 13128 in 13 Area (soil, groundwater)	Yes (3/99)
	42	Sewer Line, Bldg. 13129 in 13 Area (soil, groundwater)	Yes (3/99)
OU-4	1D	Refuse Burning Ground in 2o Area (groundwater)	No
	1E1	Subsite of Refuse Burning Ground in 32 Area (soil)	No
	1H	Refuse Burning Ground in 62 Area (soil, groundwater)	No
	4	Marine Corps Air Station Drainage Ditch (groundwater)	No
	4A	Marine Corps Air Station Concrete-Lined Surface Impoundment (groundwater)	No
	6	DPDO (DRMO) Scrap Yard and Bldg. 2241 (groundwater)	No
	16	Bldgs. 22151 and 22187 Ditch Confluence and Ditch in 22 Area (groundwater)	No
	17	Bldg. 22187 Marsh and Ditch in 22 Area (groundwater)	No
	27	Ditches Behind Bldg. 22210 in 22 Area (groundwater)	No
	30	Firing Range Soil Fill in 31 Area (soil)	No
OU-5	1A1	Second Refuse Burning Ground in 14 Area (soil, groundwater)	No
	6A	DRMO Scrap Area (soil)	No
	21	Surface Impoundment (and adjacent fuel tanks) in 14 Area (groundwater)	No
	33	Armory (Bldg. 520452) and Drainage to Southwest in 52 Area (soil, groundwater)	No
	62	Former Asphalt Batch Plant in 62 Area (soil)	No
	1111	Burn Layer in 26 Area (soil, groundwater)	No
Multiple UST sites		Underground storage tanks (USTs) with CERCLA Constituents (soil, groundwater)	No

¹ Acronyms/Abbreviations in Table: (**ACU**) Amphibious construction unit, (**LCAC**) Landing craft air cushion, (**DPDO**) Defense Property Disposal Office, (**POL**) Petroleum, oil, lubricant, and (**DRMO**) Defense Reutilization and Marketing Office.

The Technical Review Committee was established in 1991 to review and comment on actions and proposed actions with respect to releases and to facilitate input from all parties affected by environmental investigation and cleanup. The Technical Review Committee consists of 17 individuals or organization representatives, including representatives from the California Department of Fish and Game, the U.S. Fish and Wildlife Service, and the National Oceanic

and Atmospheric Administration. The Technical Review Committee meets as needed, for example, before a major project document is released for review and provides comments and recommendations to the FFA team.

When a Remedial Action or ‘no further action’ alternative is selected by the FFA team a Record of Decision (ROD), or decision document to record the decision-making process, is developed. As required by CERCLA, Section 117 (b), notice of a final ROD is published, and the ROD is made available to the public and the Technical Review Committee before adopting any Remedial Action or ‘no further action’ alternative. Any significant comments, criticisms, and new data submitted by the public requires a response and must be made available to the public before the commencement of any Remedial Action. The ROD is forwarded to the EPA for concurrence. If agreement is not reached on the selection of a Remedial Action or ‘no further action’ alternative, the EPA must make the selection, ensuring ARARs are taken into account. ‘No further action’ alternatives are selected when investigations and analysis of a site indicates that the site does not possess a risk to human health or the environment.

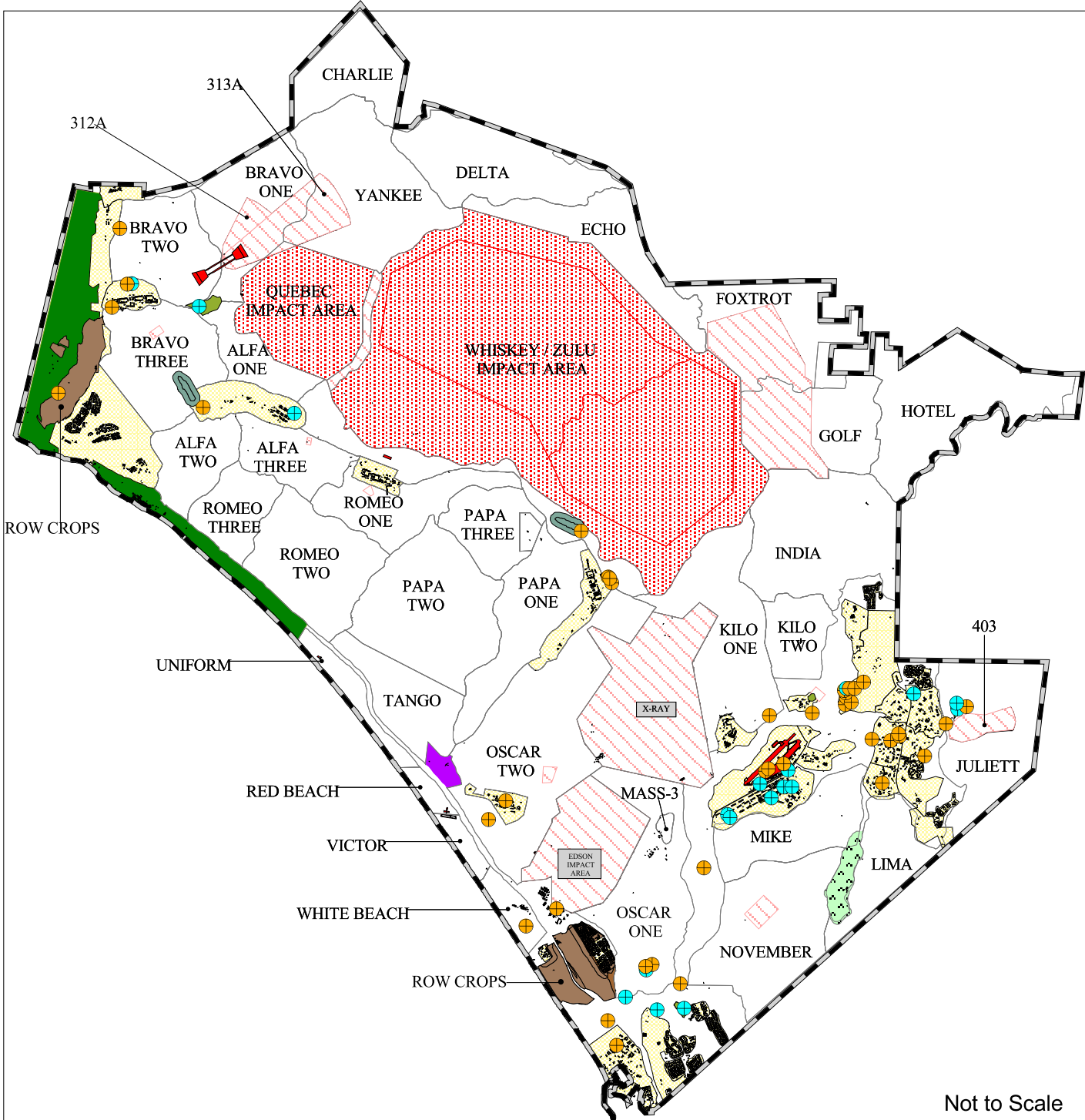
Provisions followed throughout the IR process ensure close coordination with regulatory agencies and the public. The EPA, the Technical Review Committee and appropriate state and local officials and agencies are given adequate opportunity to review and comment on assessments/studies and proposals. Remedial Program Managers solicit early involvement of other Marine Corps/Navy specialists, including natural and cultural resources personnel to ensure that the Endangered Species Act, Section 7, the National Historic Preservation Act, Section 106, and related requirements are identified and the intent of those laws are met.

Camp Pendleton natural resources staff also participate as appropriate, in the IR process to identify potential impacts to natural resources caused by the release of contaminants, communicate natural resource issues, review and comment on documents and ensure that response actions, to the maximum extent practicable, are undertaken in a manner consistent with the goals and objectives set forth in this INRMP. In addition, natural resources staff review IR maps and documents and coordinate with IR personnel to ensure that potential impacts from environmental contaminants are fully considered when planning and implementing natural resource conservation measures on the Base.

2.3.3 Real Estate Agreements and Leaseholders

A number of long-term leases and easements have become part of the land use practiced on the Base. These include Interstate 5 and the U.S. Border Patrol Checkpoint, North County Transit District railroad right of way, a 50-year lease for San Onofre State Park, utility easements, Oceanside and Fallbrook public schools, and the San Onofre Nuclear Generating Station (SONGS). A list of current leases and real estate agreements is provided in Appendix K.

Existing Base real estate agreements (e.g., leases, easements, assignments) cover approximately 28,500 acres of the Base (not inclusive of leased acreage within cantonment areas) (Figure 2-9). These agreements include easements for public utilities and transit corridors; leases to public educational and retail agencies; State Park leases; and agricultural leases for row crop production, seed collection, and grazing. Much of the real estate agreement



Not to Scale

- Camp Pendleton Boundary
- Training Area Boundaries
- Buildings, Paved Roads & Parking Areas
- Firing Range Impact Areas (Non-Dud Producing)
- Marine Corps Air Station
- Central Impact Areas (Dud-Producing)
- Cantonment
- Historical Site
- Golf Course
- Row Crop Agriculture
- San Onofre State Park & Beach
- Landfills (Active)
- HOLF
- Installation Restoration (IR) Sites (No ROD)
- Installation Restoration (IR) Sites (ROD)

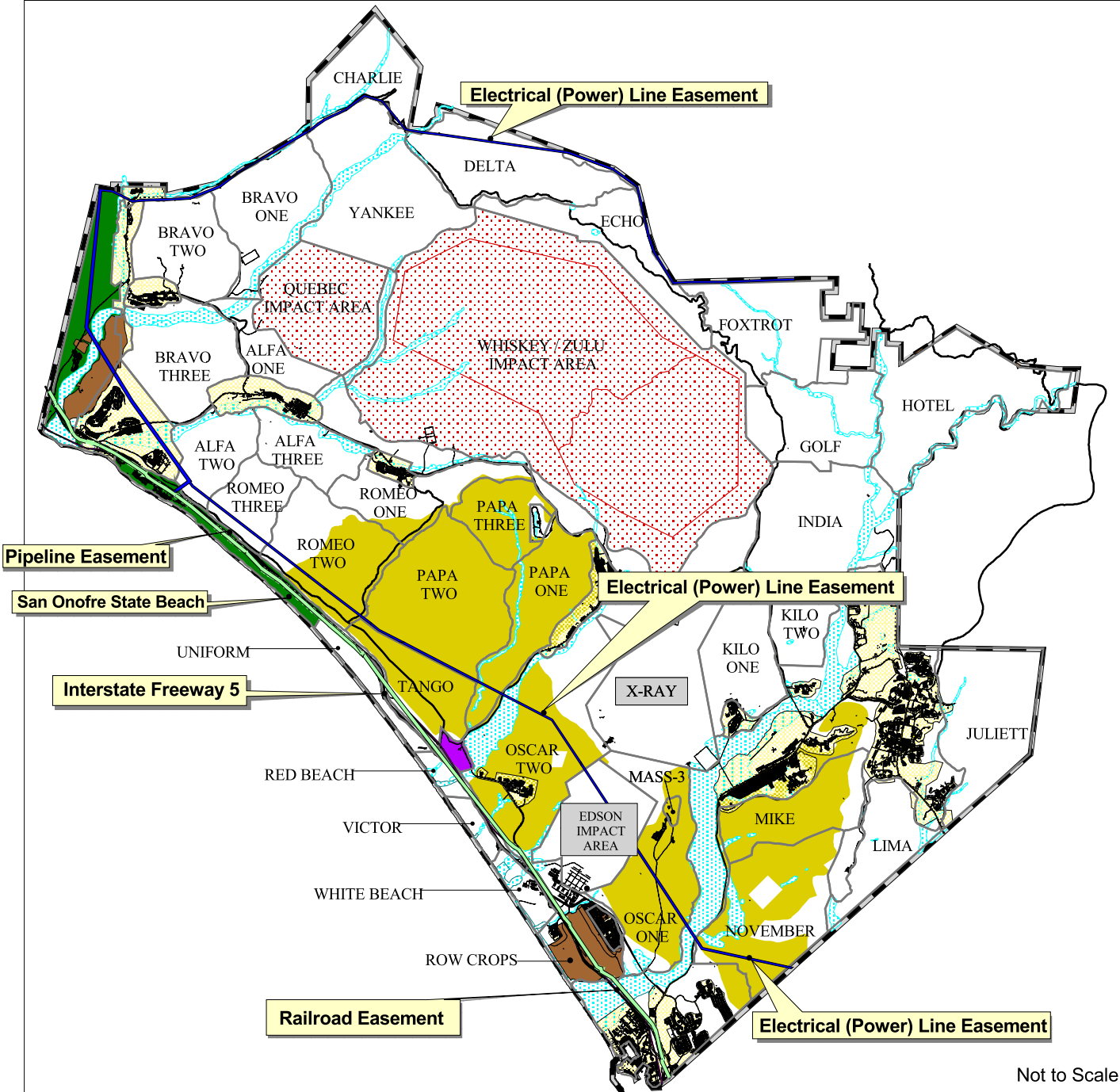
Figure 2-8
Installation Restoration (IR) Sites



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- Camp Pendleton Boundary
- Training Area Boundary
- Cantonment
- Paved Roads and Buildings
- Riparian, Beach & Estuarine Habitats
- Interstate Highway (I-5) Easement
- Railroad Easement
- Electrical Transmission Line Easement
- Pipeline Easement
- Agricultural Lease
- Sheep Grazing Lease
- Boy Scout Lease (Historical Site)
- San Onofre State Park & Beach Lease

Figure 2-9
Real Estate Agreements and Leases



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acreage is also available to training (e.g., utility corridors, State Park land, and land used for grazing); only an estimated 3,600 acres is not available for training.

2.3.3.1 AGRICULTURE

The Base leases approximately 24,000 acres for intermittent livestock grazing and 1,300 acres for row crop production (Figure 2-9). In addition, an undetermined amount of land is available under a lease agreement for native seed harvesting. Each lease specifies soil and water conservation practices required to protect and improve land productivity and fertility, a schedule for application of the required practices, and provisions for restoration of the land upon termination of the lease. Additionally, each plan includes agricultural and pest management practices that are consistent with state and federal regulatory requirements and the overall goals of the Base per MCO 5090.2A (USMC Environmental Compliance and Protection Manual). Per 10 U.S. Code §2667 and the Navy Real Estate Manual P-73, funds obtained from agricultural leases can only be used for administrative support of agricultural leases and financing multiple land use management programs.

Livestock Grazing

Cattle grazing was historically the principal form of land use at Camp Pendleton. It is thought that livestock grazed the land since the late 1700s. According to interviews with previous residents of the Base, it is estimated that in excess of 25,000 head of cattle were grazed on about 82,500 acres of the Rancho.

Currently, approximately 24,000 acres of land at Camp Pendleton are outleased for sheep grazing. The acreage available for grazing overlays active training areas and thus can only be utilized when grazing will not interfere with military training. This reduces overall grazing pressure. The Land Management Branch is responsible for establishing animal carrying capacity, which has been set at approximately 44,000 sheep-unit months (a sheep-unit month is the amount of forage a single ewe-lamb pair will consume in a month).

Grazing generally occurs on annual grasslands south of the Santa Margarita River and on perennial grasslands north of the river in portions of several training areas: Oscar One and Two; Papa One, Two, and Three; and Romeo One and Two (Figure 2-9). Grazing also has been utilized as vegetation control. Selective sheep grazing has been used for vegetation control in years past within the fenced compound at the Las Pulgas Ammunition Supply Point and to abate fire hazards on specific ranges (D. Lawson, pers. comm. 1995).

The grazing season typically occurs from 1 January through 31 May each year and can be extended or reduced at the discretion of the Base, depending upon available forage and military training requirements. Animal numbers are verified by government sheep counts periodically conducted by the Land Management Branch to ensure the accuracy of monthly animal number reports.

Row Crop Production

Approximately 1,300 acres of land are leased for farming. These current row crop parcels represent the remaining portion of approximately 6,000 acres that were leased for farming in the 1940s and 1950s. Even larger areas (as many as 10,000 acres) were farmed before the military purchased the property. This reduction in farmed acreage has occurred piecemeal due to both military requirements for the land and lack of suitable water available for irrigation.

Agricultural row crop acreage comprises nearly 1,300 acres of the Base. The largest contiguous row crop lease on the Base covers nearly 600 acres and is located in the San Mateo Valley adjacent to the San Onofre State Park and San Mateo Creek. The remaining row crop acreage, covered by three separate leases and totaling nearly 690 acres, is located on both sides of Interstate 5 at Stuart Mesa. All leases are due to expire in 2003.

Native Seed Collection

Contractors have commercially harvested seeds from native plants on Base since 1988. Native seeds have commercial value as stock for native vegetation restoration programs and for ornamental landscaping. In addition to gaining revenue from the commercial sale of the seeds (approximately \$10,000 per year), Camp Pendleton uses the seeds for restoration purposes on Base. The use of seeds from the Base helps ensure a genetic stock that is adapted to the environmental conditions of the area and saves money spent on site restoration.

Over 200 species are approved for harvest (a species list is provided to the contractor), but no more than 30% of the annual seed crop of a tree, brush, forb, or grass species in any individual location shall be harvested each year. All seed harvesting is done by hand and/or with hand carried vacuum type devices. Mechanical harvesting is not allowed. No mechanical injury to plants is allowed. The harvesting of endangered, threatened, or proposed endangered and proposed threatened species is regulated by the USFWS by permit. Some native plant species are harvested from October to December, while other species are harvested between April and July. Because seed collecting activity is conducted on foot, most locations on Base (excluding impact areas) are available for seed collection.

2.3.3.2 PUBLIC RECREATION - SAN ONOFRE STATE PARK

The largest single leaseholder on the Base is the State of California, Department of Parks and Recreation, which accounts for approximately 2,000 acres. Leased from Camp Pendleton on 1 September 1971 for a 50-year term, the San Onofre State Park system is divided into the San Onofre Beach Park and the San Mateo Park. The San Mateo Park lies within the San Mateo drainage, immediately adjacent to and along the north side of the creek. In general, the Park areas are used for public recreation and are subject to state regulatory requirements. Maintenance operations in the parks include maintaining the existing camping and recreational facilities, landscape maintenance, and erosion control. Military training is permissible within the parkland with advanced coordination.

2.3.3.3 SAN ONOFRE NUCLEAR GENERATING STATION (SONGS)

The San Onofre Nuclear Generating Station was established on Camp Pendleton in July 1963, when Congress passed Public Law 88-82 authorizing the Secretary of the Navy to grant Southern California Edison and San Diego Gas & Electric Company an easement for the purpose of constructing and operating a nuclear power facility. Unit 1, the first reactor, was completed in 1964. Over the past 36 years, the SONGS facility has expanded to include two more reactors (Units 2 and 3) and more land. SONGS real estate rights on Camp Pendleton are vested in nine Department of Navy issued easements and two leases. These real estate documents apply to a total of approximately 438 acres and generate more than \$900,000 in revenue annually to the U.S. Government (Note, that unlike the agricultural lease revenues on Base, by agreement, only half of SONGS revenue is received by Camp Pendleton for use in maintenance of real property. The remaining half is directed to the U.S. Treasury.) Current real estate grants authorize SONGS to maintain a presence on Camp Pendleton through approximately 2024.

Camp Pendleton is the only DoD installation in the country where a nuclear power plant has been constructed and is operated on its property.

2.3.3.4 SAN DIEGO GAS AND ELECTRIC COMPANY (SEMPRA ENERGY)

San Diego Gas & Electric (SDG&E), through its parent company Sempra Energy, holds more than 153 acres of leased land agreements with the Base. Most of these leases are jointly operated and managed in concert with the Southern California Edison Company, including the SONGS and various transmission and communication corridor easements, and associated support facilities.

2.3.3.5 INTERSTATE HIGHWAY 5 (I-5 FREEWAY)

The I-5 freeway occupies a linear corridor approximately 500 ft wide and 17 miles long that traverses the entire length of Camp Pendleton in a north-to-south direction between the cities of San Clemente and Oceanside. Comprising approximately 726 acres, the I-5 freeway is located on DoN owned land. It has been constructed within a right-of-way easement granted in perpetuity to the State of California (Department of Transportation) by DoN in the 1960s. The I-5 freeway stretches along Camp Pendleton's coastal area and is located in a scenic corridor through the Base adjacent to coastal bluffs and undeveloped beach areas. Currently, there are 11 separate underpasses (ingress/egress points) located along the 17-mile Camp Pendleton portion of I-5, which are available for the transition of military personnel, vehicles and equipment from the beach side of I-5 to inland training areas on the inland side of this freeway. These underpasses were created at the time of I-5's initial construction through Camp Pendleton in the mid-1960s. As a result of increasing vehicle size which came along with the development of new upgraded and modernized Marine Corps amphibious assault equipment over the last 40 years, only one of the current 11 underpasses remains capable of supporting passage of all military vehicles, equipment, hardware and personnel.

2.3.3.6 NORTH COUNTY TRANSIT DISTRICT RAIL LINE AND MAINTENANCE YARD

North San Diego County Transit Development Board, also known as the North County Transit District (NCTD) owns and operates a commuter rail train system between the City of Oceanside (Oceanside Transit Center) and the City of San Diego (Santa Fe Depot). This NCTD commuter rail system, known as the Coaster, provides service to one portion (the coastal communities of San Diego County) of a regional commuter rail transportation system operating within parts of San Diego, Orange, Los Angeles Ventura, and Riverside Counties. As the operator of the Coaster commuter rail system, NCTD also owns and maintains all the rail line located between the San Diego/Orange County boundary line and the City of San Diego, including the approximately 18 miles of rail line which traverses Camp Pendleton. This rail line through the Base parallels I-5, and like the I-5 freeway, it runs along the coastal area of Camp Pendleton. NCTD's railroad corridor through Camp Pendleton is contained within a 100' by 40' right-of-way easement, which has been granted to NCTD in perpetuity by the Department of the Navy to support NCTD's operation of the Coaster commuter rail system through the Base.

As owner of this rail line between the City of San Diego and the Orange County border, NCTD also coordinates and approves use of this railroad line by other train operators including the Metrolink commuter rail trains that serves Orange and Los Angeles Counties, Amtrak trains, and Burlington-Northern Santa Fe (BNSF) freight trains. Currently, approximately 50 trains per day pass through Camp Pendleton on this track.

In support of their commuter rail operations, NCTD also maintains and operates a 24-hour Commuter Rail Maintenance Facility located on Camp Pendleton. This Commuter Rail Maintenance Facility, located within the Stuart Mesa area of Camp Pendleton, is situated immediately adjacent to NCTD's railroad right-of-way through the Base. It's existence and construction was authorized by a second and separate easement in perpetuity, granted by DoN to NCTD in 1994 for operation of this Maintenance Facility. This NCTD easement also supports the operation of a BNSF railroad switching yard that is located adjacent to the Maintenance Facility. Altogether the easement for the NCTD Commuter Rail Maintenance Facility and BNSF switching yard operations total approximately 20 acres.

2.4 REGIONAL LAND USE AND CONSERVATION PROGRAMS

Regional land use provides a context for understanding the circumstances under which the Base currently operates and a starting point for understanding its conservation role as a result of land development trends, regional socio-economics, land planning decisions made by agencies other than the DoD and regional conservation efforts. Understanding regional land uses and conservation efforts also provide a context for predicting future trends. Camp Pendleton cannot manage its resources and operate in isolation of the surrounding region. Just as the presence of the Base affects surrounding communities land use decisions, land use and conservation efforts in the region affect the Base.

Land uses and regional growth over the past 200 years, have significantly influenced not only the physical appearance of Camp Pendleton and its environs, but also the ecological setting in which the Base finds itself today. Southern California has a substantial number of federally listed threatened and endangered species due primarily to the loss of habitat caused by increasing human population and development. Military installations in southern California, with their requirement for large open spaces for training, are among the last remaining places for the region's listed and sensitive species. Camp Pendleton has managed to maintain more than 90% of its military training lands as undeveloped. By virtue of this land mass, location, and open space, Camp Pendleton contributes significantly to the continued survival of the threatened and endangered plant and wildlife species in San Diego County. Of the 38 federally listed threatened and endangered species in San Diego County, 18 occur on or transit Camp Pendleton, which has only about 4.6% of the total land area of the county. With dwindling habitat remaining in the region for many of these species, the Base's resources represent a substantial contribution to the remaining populations and habitats of these species. Camp Pendleton currently represents:

- Approximately 20% of the least tern (*Sterna antillarum browni*) population breeding in California;
- 12% of the region's coastal California gnatcatcher (*Polioptila californica californica*) populations;
- Nearly 6% of the region's coastal sage scrub habitats;
- More than 50% of the region's least Bell's vireo populations (*Vireo bellii pusillus*);
- Approximately 12% of the southern California southwestern willow flycatcher (*Empidonax traillii extimus*) population and 24% of San Diego County southwestern willow flycatcher population (Kus 2001);
- 42% of San Diego Counties breeding western snowy plovers (*Charadrius alexandrinus nivosus*) (Pers. comm. Jill Terp, USFWS; data provided by U.S. Geological Survey and USFWS field monitors);
- 75% (3 of 4 sites) of the known populations of Pacific pocket mouse (*Perognathus longimembris pacificus*);
- Western-most coastal populations of Stephens' kangaroo rat (*Dipodomys stephensi*);
- 100% of the known tidewater goby (*Eucyclogobius newberryi*) populations in Orange and San Diego Counties (USFWS 2000a);
- Most abundant populations of Arroyo toad (*Bufo californicus*) in three major drainages;
- Approximately 10% of the remaining vernal pools in San Diego County. Additionally, the Department of Defense lands (Camp Pendleton and Miramar) represent 88% of the remaining vernal pools in San Diego County;
- More than 30% of the region's thread-leaf brodiaea populations (*Brodiaea filifolia*);

2.4.1 Regional Environment: Adjacent Land Use and Trends

Increasing population growth and the resulting pressure to accommodate more and more people within southern California is the primary driving force for land use and trends in the region surrounding Camp Pendleton. Statewide, more than 34 million people currently live in California, with nearly 20 million people in southern California, including Imperial, Los

Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara, Ventura Counties (Census 2000 population numbers; California Department of Finance 2001). Projected population growth figures suggest the situation will only worsen. California is predicted to increase to 40 million as it approaches 2010, 45 million in 2020, and nearly 60 million in 2040 (December 1998 projections; California Department of Finance 1998). According to a press release (3 May 2000) from the Demographic Research Unit of the California Department of Finance, the top five fastest growing counties in the state based on numerical population increases are Los Angeles, San Diego, Riverside, Orange, and San Bernardino Counties. Southern California (defined using the same counties listed previously) is projected to increase to populations over 23, 26, and 34 million in 2010, 2020, and 2040, respectively (December 1998 projections; California Department of Finance 1998).

The southern California landscape is rapidly changing due to the increasing urbanization and unimpeded development needed to support the region's population growth. Urbanization and development pressures have occurred, and are expected to continue to occur, along the coastal strip stretching from metropolitan Los Angeles to San Diego. Consequences of this urbanization and development include a decrease and displacement of agricultural acreage and open spaces, an increase in habitat fragmentation and isolation, and an increase in the number of native and endemic species and habitats that are becoming threaten with extinction. A recent report by The Nature Conservancy tallied all known extinctions in the U.S. state-by-state since the 17th century. California led the list for the continental U.S. with 46 known or suspected extinctions of plants and animals. Dobson et al. (1997) tallied the number of rare and federally listed threatened and endangered species county-by-county across the continental U.S., and San Diego County led the list.

Camp Pendleton and the adjacent Cleveland National Forest occupy some of the last significant open space and wildlife habitats in the coastal areas of southern California. A two-year research study (Steinitz 1996) conducted as a collaborative effort by Harvard University, Utah State University, National Biological Service, the U.S. Department of Agriculture Forest Service, EPA, The Nature Conservancy, and the Biodiversity Research Consortium concluded that, "By 2030, urbanization will completely surround Camp Pendleton, with the exception of the Cleveland National Forest (approximately 12 kilometers along [Camp Pendleton's] northern boundary), and the Pacific Ocean." In fact, within the last 5-7 years, 19 new residential developments were either approved for construction or have been built in communities and other open space lands surrounding Camp Pendleton.

2.4.1.1 COMMUNITIES OF DELUZ AND FALLBROOK

Northeast of Camp Pendleton and south of the Cleveland National Forest is an unincorporated area of San Diego County that includes the communities of DeLuz and Fallbrook. These lands are currently designated as estate residential, which limits development to residential units of a density no greater than one unit per two acres of unimproved land. This does not limit large tracts of real estate from being developed at once as long as the overall average meets the requirements for estate residential. DeLuz is the closest buildable area to training areas on Camp Pendleton without any type of buffer to minimize land use conflicts between residential uses and military training. Although Camp Pendleton's impact areas are separated from

residential areas by space allocated for maneuvers, this space is of limited size and potential use, leaving a potential for conflict similar to that which has occurred on the Base's southern boundary near the San Luis Rey gate on Vandergrift in eastern Oceanside. This is most evident in the area around DeLuz and north of the developed Fallbrook community. The area surrounding the developed portion of Fallbrook and to its south is somewhat buffered by the Naval Weapons Station Seal Beach, Fallbrook Annex. The land use is industrial; however, the interval of operation is regulated and separation is such that any nuisance associated with its operation does not impact areas outside of the facility.

Developments in unincorporated areas submitted for approval to San Diego County in the last three years have tended to congregate around the developed portion of Fallbrook. Approximately 50 percent of the proposed developments are located in or adjacent to Fallbrook proper. The remaining planned developments are to the east of Fallbrook closer to the I-15 corridor. The total amount of proposed development in the area, both approved and unapproved by the county since 1993 consists of about 800 units on 1,065 acres. Most of these have been constructed by 2000. The scale of development in northeastern San Diego County is only a fraction of that in San Clemente.

2.4.1.2 CITY OF OCEANSIDE

The southeastern boundary of Camp Pendleton is shared entirely with the City of Oceanside. The western portion of Oceanside, its commercial district, has grown along with the growth of the Base itself. The types of land uses found in this area are common to both sides of the boundary. A mixture of residential, commercial, and light industrial areas abounds in Oceanside as well as in the adjacent southwestern area of Camp Pendleton. New development in Oceanside, which consists mainly of housing and its related entities, has pushed east to previously vacant land and now constitutes a large percentage of the common boundary with the Base.

The largest portion of the new development in Oceanside is residential units adjacent to training areas just south of the Headquarters Area along Vandergrift Boulevard. A review of city records shows that this development is consistent with their existing General Plan; however, the Oceanside General Plan makes no mention of noise from training activities on Camp Pendleton.

2.4.1.3 CITY OF SAN CLEMENTE

Except for a downturn period in the economy during the early 1990s, development within the City of San Clemente, located adjacent to Camp Pendleton's northern border, has proceeded at a relatively fast pace over the last decade. Practically all developable property along San Clemente's southern boundary with the Base has been developed to its full potential, with the exception of one area of the community located along the northeastern corner of Camp Pendleton. The San Clemente approved that portion of the city, known as the Talega area for development in 1998. The Talega project, which began construction in 1999 and is expected to

reach full build-out by 2010, will be a 4,000-unit residential housing development along with several small parcels of supporting commercial property.

The increased numbers of residential housing areas and growing San Clemente population now found along Camp Pendleton's northern boundary is expected to result in increased incidents of noise complaints arising from this community area north of the Base. This growth in San Clemente's population over the last decade is not unlike the same increased levels of growth that has been occurring throughout all communities in Orange, San Diego, and Riverside Counties (the three counties along Camp Pendleton boundaries) during the last ten years. This regional population growth is expected to place ever increasing demands on an already overburdened regional transportation and infrastructure system. One such example of how this continued regional population growth can potentially affect Camp Pendleton can be seen in an Orange County joint powers agency (the Transportation Corridors Agency [TCA]) proposal to construct a future toll road transportation project on this Base. In that case, the TCA proposes to build this road project through five miles of Camp Pendleton along the Base's northern boundary adjacent to the City of San Clemente. The status of this proposed transportation project continues to be monitored by the Marine Corps.

2.4.1.4 CLEVELAND NATIONAL FOREST

Roughly 25 percent of the eastern boundary of Camp Pendleton is contiguous with the Cleveland National Forest or holdings of the Bureau of Land Management that are virtually uninhabited. This open space represents an important habitat linkage and wildlife corridor for the Base. The only conflict that occurs in this area is the infrequent violation of the Base boundary by visitors to the forest. These infrequent violations may be misguided hikers, willful trespassers, and/or game poachers. While such occurrences are a relatively minor concern, they are monitored and any proposed change of the wilderness designation of the National Forest that would increase access to the area would be of concern to the Marine Corps. Areas with the wilderness designation are closed to all forms of mechanized transportation and are currently lightly traveled due to their isolation and limited access.

2.4.1.5 PACIFIC OCEAN

Development along Camp Pendleton's western boundary is limited by the Pacific Ocean. The only type of permanent development feasible would be facilities to support offshore oil exploration and drilling. This has been proposed in the past and considered by the Department of the Interior for the granting of leases to the oil industry. The status of the leases is being monitored by the Marines as well as many environmental groups.

2.4.2 Natural Communities Conservation Planning (NCCP) Programs

Over the past decade, southern California has become a focal point for regional conservation planning efforts that focus on ensuring the continued survival of sensitive plant and wildlife species their associated habitats. These efforts have been facilitated by the Natural Community

Conservation Planning (NCCP) Act of 1991 passed by the State of California. The NCCP process was developed to encourage the conservation of natural communities before species within those communities are threatened with extinction. The NCCP program goals are to provide long term protection for natural communities on a regional basis while allowing continued urban development and growth. It is designed to be a voluntary, collaborative effort, primarily involving landowners, local government, and state and federal agencies. The NCCP approach represents an ecosystem view.

NCCP program goals were developed to provide a regional framework for long term protection of natural communities and species, while allowing continued development and economic growth of selected private lands (CDFG 1992). NCCP members include state and local governments, developers, conservation groups, and small landowners, but not federal agencies. Since coastal sage scrub represents a community in southern California with many sensitive species, including the coastal California gnatcatcher, this community became the first focus of the program. The planning area includes parts of San Diego, Orange, Riverside, Los Angeles, and Santa Barbara counties. Natural communities on private land may be protected through regulation, land purchases, transfer, conservation easements, and other strategies. Completed “landscape conservation” plans are legally binding and based on CDFG criteria and guidelines (Peck 1993).

Three subregional plans are being developed in San Diego County under the NCCP program umbrella, and several sub-area plans are in the works or have been completed recently. The subregional plans approved or pending completion include: the Multiple Species Conservation Plan or MSCP (City and County of San Diego) approved in 1996, the Multiple Habitats Conservation Plan or MHCP (includes seven incorporated cities in north county) (pending completion) and the County of San Diego Multiple Habitats Conservation and Open Space Plan (MHCOSP) (pending completion). Regions to the north and east of Camp Pendleton are also participating in the NCCP program with the development of three NCCP subregional plans in Orange County, including the Southern (pending completion), Northern (pending completion), and Central-Coastal NCCPs (approved) (Figure 2-10)

2.4.2.1 MULTIPLE SPECIES CONSERVATION PROGRAM

Since the early 1990s, San Diego County became a focal point in the state and the nation for regional conservation and management planning efforts resulting from the NCCP program described above. The Multiple Species Conservation Program was completed (signed) in 1996, and the process of building the reserve initiated by local jurisdictions and resource management agencies. Once all subarea plans are approved the MSCP is expected to encompass 582,000 acres and establish 172,000 acres of preserve in southwestern San Diego County (City of San Diego 1997) and provide coverage for 85 species of plants and animals and 23 vegetation types.

The MSCP encompasses eleven planning Subareas that are in various stages of plan development. Approved Subarea Plans to date include the La Mesa Subarea Plan, Poway Subarea Plan, City of San Diego Subarea Plan, and the County of San Diego Subarea Plan.

2.4.2.2 MULTIPLE HABITAT CONSERVATION PLANNING (MHCP) AND NORTH COUNTY WILDLIFE FORUM

The MHCP is a comprehensive habitat conservation planning process being developed to address multiple species needs and the preservation of native vegetation residing within seven city jurisdictions across northern San Diego County, namely Carlsbad, Encinitas, Escondido, Oceanside, San Marcos, Solana Beach, and Vista. These cities encompass a 183-square-mile (about 119,000-acre) area. The MHCP is recognized as a subregional plan that helps fulfill the requirements of the NCCP Act. Although the San Diego Association of Governments (SANDAG) is coordinating the MHCP for these North County cities, it will be implemented through individual sub-area plans prepared by each local jurisdiction, and potentially by other public entities, and will allow local jurisdictions to maintain land use control and development flexibility. The plan is designed to streamline procedures for review and permitting of projects.

2.4.2.3 MULTIPLE HABITAT CONSERVATION AND OPEN SPACE PROGRAM (COUNTY OF SAN DIEGO MHCOSP)

The County of San Diego has deferred planning within this subregion until it completes its North County Sub-Area Plan amendment to the MSCP.

2.4.2.4 SAN DIEGO GAS & ELECTRIC (SDG&E) COMPANY SUBREGIONAL PLAN

The NCCP Subregional Plan for SDG&E, extending from southern Orange County to the Mexican border, was the first plan approved in San Diego County (in 1995). The project provides coverage for 110 plant and animal species and emphasizes avoidance of impacts. The plan establishes mitigation requirements, which may include revegetation or use of up to 240 acres of mitigation credits, set aside in several land parcels purchased by SDG&E, as mitigation banks. SDG&E's properties and easements play an important role in the NCCP region in providing habitat connectivity in areas where little natural habitat remains.

2.4.2.5 SOUTH ORANGE COUNTY SUBREGIONAL PLAN

Development of a subregional plan for south Orange County is currently underway. This southern subregion of Orange County is one of eleven NCCP subregions, within the five county southern California ecoregion, that has been identified by the southern California NCCP program to focus on coastal sage scrub conservation. The South Orange County Subregional Plan is expected to set aside tens of thousands of acres of a variety of habitats.













This subregional plan extends as far north as Dana Point along the coast north of Camp Pendleton, and inland to the Santa Ana Mountains in the Cleveland National Forest.



(Data Source: <http://ceres.ca.gov/CRA/NCCP/cssreg.htm>)

Not to Scale

Figure 2-10
Southern Coastal Sage Scrub
NCCP Region

-  Southern Coastal Sage Scrub NCCP Region
-  Marine Corps Base, Camp Pendleton
-  North San Diego MHCP
-  County of San Diego Sub-Area (MSCP)
-  City of San Diego MSCP
-  San Diego County HCOSP
-  Orange County Central/Coastal Subregion
-  Orange County Northern Subregion
-  Orange County Southern Subregion
-  Palos Verdes Peninsula NCCP
-  Western Riverside County MSHCP
-  San Bernardino County Subregion



Map Source:
AC/S Environmental Security
GIS Branch
October 2001



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2.4.2.6 CENTRAL COASTAL ORANGE COUNTY SUBREGIONAL PLAN

The Central Coastal Orange County Subregional Plan was approved in July 1996. It established a reserve system covering more than 37,300 acres, 12 regional habitat types, and 39 different sensitive plant and wildlife species.

2.4.3 Other Regional Conservation and Management Programs

Other local, state and federal entities are developing NCCP-equivalent or ecosystem based natural resource conservation and management plans similar to, but independent of, the State NCCP process. For example, Riverside County gave substantial consideration to the State NCCP program, initially drafting the Western Riverside County MSHCP. Ultimately, however, this plan evolved into the Riverside County Integrated Planning (RCIP) program, with increased stakeholder involvement and founded on the principles and concepts of ecosystem management identified by the States NCCP process (pending completion) (Figure 2-10).

Also playing a major role in regional planning efforts are the many DoD installations scattered across the southern California landscape. Local DoD installations, such as MCAS Miramar, MCB Camp Pendleton and the U.S. Navy, although continually active in resource management activities throughout their history in the region, have been moving forward in their efforts to move from a species-by-species approach to resource management, toward a more landscape scale, ecosystem approach through development and implementation of (and updating) Integrated Natural Resource Management Plans.

2.4.3.1 RIVERSIDE COUNTY INTEGRATED PLANNING PROGRAM

The County of Riverside decided not to participate in the southern California NCCP program. Rather, the Riverside County elected to develop its own regional conservation planning and management program independent of direct NCCP participation. However, planning efforts by the county are being conducted in cooperation with all county stakeholders, including landowners and state and federal resource management agencies. A draft of the Riverside County Integrated Planning program is pending completion of formal review. Camp Pendleton continues to monitor the RCIP progress and development.

The RCIP program provides a framework that affects future decisions on land use, habitat conservation, and transportation planning. The decisions addressed required an integrated approach that is stakeholder-driven. The approach attempts to focus technical analysis to respond to the common vision as agreed to by all regional stakeholders. The goals of the RCIP program include: (1) update the County General Plan, (2) create a Multiple Species Habitat Conservation Plan (MSHCP), and (3) identify transportation corridors to solve the County's future transportation needs.

Prior to the RCIP effort, nine jurisdictions, including the County of Riverside, prepared a MSHCP and a Planning Agreement that was expected to be signed by 1997. The MSHCP was being developed by the Riverside County Habitat Conservation Agency (RCHCA). The

MSHCP attempted to build upon the previously approved Stephens' Kangaroo Rat Habitat Conservation Plan. Core area reserves in the Stephens' Kangaroo Rat Habitat Conservation Plan included habitats such as riparian, oak woodland, and up to 15,000 acres of coastal sage scrub. The RCHCA established a scientific advisory group to assist in providing scientific information to the RCHCA. Information developed as part of the RCIP planning effort is expected to form the basis for completing the County's Multiple Species Habitat Conservation Plan.

2.4.3.2 DEPARTMENT OF DEFENSE INSTALLATIONS

Department of Defense lands are used for a wide variety of purposes, including munitions testing, deployment of weapons systems, and combat training, recreational opportunities (e.g., hunting and fishing) and agriculture. Designated airspace is used to train pilots and test fighter planes and air-based weapons systems. The DoD is also steward for some of the nation's most important biological resources. Many installations include substantial areas where natural ecological communities have not been substantially altered, in contrast to surrounding areas where landscapes often have been converted as part of urbanization or for agricultural purposes. These open areas may be particularly diverse and rich in species and habitats. This is especially true in San Diego County, where DoD installations such as Camp Pendleton and MCAS Miramar contain a majority of some remaining native species and habitats once prevalent throughout San Diego County (e.g., 80-85% of remaining vernal pools, 75% of known sites supporting Pacific pocket mouse, more than 50% of least bell's vireo locations, etc. [see introduction to Section 2.4]).

On DoD installations valuable regional biological resources remain due to the mission requirement for large contiguous undeveloped areas for training or as buffer/safety areas around critical facilities such as airfield and ordnance storage areas. A wide variety, as well as significant quantity and quality, of regionally important habitat types that support many locally rare, state sensitive, and federally listed species of plants and animals occur on these installations. Additionally, DoD lands provide valuable regional habitat linkages. In Camp Pendleton's case from the Santa Ana Mountains of the Cleveland National Forest to the southern California coastline, and linkages necessary to connect habitats of southern Orange County with those remaining open space lands identified in the MHCP in northern San Diego County.

DoD, in adopting an ecosystem-based philosophy and approach to managing the many natural resources found on its many military installations, is preparing, developing and implementing INRMPs that are installation-specific. These INRMPs will promote the use of DoD resources in a manner consistent with the DoD's mission, while ensuring the continued conservation and survival of many of the region's dwindling sensitive species and habitats. The combination of partnership, development and integrated planning provides a means for integrating biodiversity conservation with existing military activities and other regional conservation initiatives surrounding the installation. INRMPs address large-scale, landscape planning and management effort on military lands to support regional planning efforts and incorporate the philosophy, standards, guidelines and goals of ecosystem management within its resource management programs and processes.

2.5 REGIONAL ISSUES AFFECTING CAMP PENDLETON'S MISSION

Camp Pendleton is, and will continue to be, affected by the geographic, socioeconomic, and ecological setting of the region within which it is located. Land use planning and growth management efforts of local and regional jurisdictions have a potentially significant influence on the Base's land use, planning, environmental compliance, and natural resource utilization and management. For the past fifty years, the southern California region has been marked by rapid urbanization, unimpeded development, and spiraling population growth. Projected population growth figures for the region suggest the situation will only intensify (Section 2.4.1). Trends in conservation planning, new since this study was made, may preserve additional open space in the region, however, most of these plans are still being developed or are in the early stages of implementation.

These regional influences ultimately constrain the Base's ability to train Marines. The individual and cumulative effects of these regional influences represent encroachment on the Base's ability to accomplish its mission. In this context, the term encroachment refers to "any action planned or executed in the vicinity of a Marine Corps installation's normal area of operations which inhibits, curtails, limits, or possesses the potential to impede the Marine Corps' interests" (HQMC 1987). Nonmilitary projects adjacent to or within Camp Pendleton's borders that are continually proposed must be acknowledged by Base planners, military trainers, and the surrounding developing communities, as part of actual or potential encroachment. For example, leases and easements, particularly above ground utilities such as the SONGS, SDG&E, I-5, and railway lines, represent a severe constraint to military training activities, particularly to amphibious landing exercises along the Base's entire western boundary. Currently, only one underpass (out of 11 total) along the entire 17 miles of beach allows for passage of all types of military vehicles. Ultimately, this encroachment degrades military training and readiness capability, as well as constrains natural resource management on Camp Pendleton.

Urbanization, unimpeded development, and spiraling population growth in the region have created pressure along the Base's boundaries affecting how Marines train. Ultimately, this encroachment degrades military readiness capability. This same unchecked development that is creating encroachment pressure on the Base has also placed San Diego County in the position of having more listed rare, threatened, and endangered plant and wildlife species than any other county in the continental United States. Indirectly, this, too, has created a form of encroachment pressure for Camp Pendleton with an increasing dependence on the Base and any remaining open space for habitat for these species.

Throughout its nearly 60 years in the region, Camp Pendleton has endeavored to work closely with surrounding communities, local jurisdictions, and private entities. However, the Base lands have been, and continue to be, subject to both direct and indirect pressures from surrounding communities and the region for land use (e.g., leases and easements) and mission restrictions (e.g., noise). Moreover, Camp Pendleton is concerned that, as regional development continues to encroach on natural habitats off Base, its land will become increasingly, and disproportionately, important to regional habitat and sensitive species conservation. This presents another pressure on the Base. For example, as more species are federally listed as threatened or endangered (regardless of whether the species have thrived

locally on Base), the Base is burdened with additional regulatory requirements and management needs. Such encumbrances are viewed as encroachment threats to the military mission as they affect how Marines train and potentially degrade military readiness. As regional populations increase, pressures from encroachment are expected to only worsen. The Base wants to ensure that its training lands do not become viewed as opportunities for further development expansion (e.g., for commercial airports, additional transit corridors) or as regional preserves in which training activities are then undesirably constrained or prohibited altogether. It is important that Camp Pendleton's efforts to maintain open, undeveloped land within its borders is not viewed by the region as "the solution" for land use needs due to the perceived minimal economic and political cost of using the Base's land (Creswell 1993).

Ultimately, the increased value in the Base's land has the potential to jeopardize the long term sustainability of the military mission. Yet it is the very presence of the Marine Corps at Camp Pendleton for nearly sixty years that has made the land so valuable in the first place. Several encroachment issues have been identified by Camp Pendleton's CG and other military personnel as serious threats to Camp Pendleton's very existence as a military training base. Several of these encroachment threats are presented within this section to help maintain vigilance and to foster a greater understanding of these issues by both the Base and surrounding communities.

2.5.1 Public Interstate Freeways, Railroad Right-of-Ways, and Future Transportation Corridors

An easement of approximately 726 acres, for the construction, operation, and maintenance of I-5, along with additional easements for operation of two Interstate Rest Stop areas, two California Highway Patrol Truck Weigh Stations, and an Immigration & Naturalization Service Border Patrol Checkpoint facility, have all been granted to State and federal agencies for the operation of these facilities on Camp Pendleton land by the Department of the Navy. All of these easements have been granted in perpetuity. The I-5 easement, in particular, presents a significant impact to the Camp Pendleton training mission because of its creation of an artificial barrier between the beach area and inland portions of the Base. I-5 runs the entire length of Camp Pendleton along the coastal bluff area of the Base, and as a result of its presence, it actually separates the entire length of Camp Pendleton's beaches from all of the Base's inland training areas. This man-made barrier severely restricts the transition of amphibious training operations to the Base's interior training areas where the majority of field training occurs. Only a limited ability is currently available to cross this I-5 barrier through the use of small underpass tunnels for crossing under the freeway. These underpass crossings were constructed to support the movement of troops and equipment in use at the time this freeway was built in the 1960s. While not totally preventing Base training operations to occur, in today's day and age of larger amphibious vehicles and weapons systems, large scale movements of troops and equipment are greatly hindered due to the small size of these freeway underpasses. Unfortunately, the I-5 freeway represents the only direct means of public highway access between San Diego and Los Angeles, two of the largest cities in the United States. With the huge political and financial pressures it places on the system, this Interstate highway will remain a permanent fixture of Camp Pendleton landscape.

Running adjacent and parallel to I-5 is a railroad line that also traverses the entire length of Camp Pendleton in a north to south direction. Like I-5 does for vehicles, this rail line provides the only direct rail linkage between the cities of Los Angeles and San Diego. The presence of this rail line through the Base actually dates back to the late 1880s when it was initially constructed as the very first rail line connection between these two large metropolitan areas. Over the course of its hundred-plus years of existence on land that's now Camp Pendleton, the alignment of this rail line has been adjusted on several different occasions. Generally speaking, however, this rail line has continued to remain a landmark and permanent fixture along the entire coastal portion of Camp Pendleton. Like I-5, this rail corridor, located parallel and adjacent to I-5, also creates an access barrier between the beach areas of the Base and Camp Pendleton's inland training areas. It presents one more man-made obstacle that must be negotiated (through crossing over or under) by military personnel and vehicles during amphibious training exercises.

As previously stated in Section 2.3.3.6, the North San Diego County Transit Development Board, also known as the North County Transit District, is the current owner and operator of this rail line through the Base. This rail corridor is primarily used to support commuter rail train operations serving communities in both San Diego and Orange Counties; but this rail corridor also supports Amtrak and freight train operations on a daily basis. Approximately 50 trains per day pass through Camp Pendleton on this track.

The Southern Orange County Transportation Infrastructure Improvement Program (SOCTIIP) is a planned 4-lane toll road approximately 16 miles in length. It's being planned and developed by the Transportation Corridor Agencies, a Joint Powers Agency in Orange County, to serve as a transportation alternative to I-5. Once built, it would connect the inland portion of central Orange County with the northern portion of San Diego County. SOCTIIP will complete the last of three new toll roads being constructed in Orange County by the TCA, all designed to help alleviate existing traffic gridlock and mitigate the increased traffic growth forecast to occur in southern Orange County by the year 2010. The TCA has already completed 51 miles of this planned tollway system; SOCTIIP will add the final piece in completing Orange County's 67-mile network of toll roads.

In 1988 the Marine Corps Commandant agreed that the TCA could evaluate an on-Base alignment of the proposed SOCTIIP toll road project, subject to the following stipulations: (1) that other off-Base alignment alternatives must also be considered and evaluated in an equal manner; (2) that any planned Camp Pendleton alignment must closely adhere to the Base's northern boundary; (3) that any adverse environmental impacts created as a result of siting this route on the Base must be fully and properly mitigated; and most importantly, (4) that any on-Base alignment must not impact the Marine Corps' mission nor interfere with the Base's operational flexibility. This Marine Corps position has remained steadfast throughout the years of TCA planning for this proposed toll road; and the Marine Corps continues to monitor and sometimes participate in TCA's further planning efforts for this proposed transportation improvement project. If constructed on Camp Pendleton, only one alignment alternative, meeting the above stipulations, is considered acceptable to the Marine Corps.

2.5.2 Public Utilities

Easements for public utilities (and access roads/corridors to maintain those utilities) are located throughout the Base. These facilities include supporting structures for power lines, telephone lines, cellular towers, radio repeaters, fiber optic cables, and pipelines. While each easement may not seem significant in its own right, when taken as a whole they do have the potential to restrict or constrain amphibious and aviation training opportunities. The physical structures located in these easements (e.g., power poles and telephone poles) pose restrictions on ground and air movement.

The San Onofre Nuclear Generating Station is another non-DoD tenant facility located on Camp Pendleton along the coastal area of the Base on approximately 450 acres of leased property. This facility is contained within two separate lease areas on each side of I-5

2.5.3 Commercial Airport Facilities

At least 40 airports exist within a 60-mile radius of the Base. Most airports in southern California are operating at or near maximum capacity. It has been projected by most regional planning agencies that by the year 2025, air travel and passenger volume in southern California will double. SANDAG, San Diego County's regional transportation planning agency, is currently in the process of evaluating whether there is a potential to locate a new commercial airport facility somewhere within the regional area to meet San Diego County's growing passenger and air cargo needs. As has occurred in several previous airport siting studies, Camp Pendleton has been suggested as a potential location for the siting of such an airport, or even if an airport were not to be sited here, the Base could serve as the host site for relocation of other military activities from other DoD installations considered more favorable as a commercial airport site. This airport siting issue was most recently raised during the November 2000 election campaign for the City of San Diego Mayoral election.

There are no areas on Camp Pendleton where a large commercial airport could be located without a devastating impact on training operations and natural resources. The relatively level coastal plain, where a commercial airport might be most suited, is extensively occupied by most of the remaining vernal pools (and associated threatened and endangered flora and fauna) in San Diego County and three of the four remaining locations of the endangered pocket mouse.

2.5.4 Recreational Use and Access

Camp Pendleton receives numerous requests to access the Base for recreational purposes. This is largely due to the fact that the Base has one of the last remaining extensive tracts of undeveloped coastal land in southern California, from the Mexican border to Ventura County; and the Base is situated between two of the largest population centers in the state, San Diego and Los Angeles. Base policies support recreational access when it does not conflict with mission, security, and safety requirements. Chapter 5 provides detailed information on recreational and public access programs. Any proposed development of non-military land uses

along the coastal area of the Base is of great concern because of the need to ensure continued access to landing beaches and inland access routes in conjunction with amphibious training activities. This is also the area of most recreational encroachment with the Marine Corps' use of the Base's northern beaches already limited by the lease to the State Park for the San Onofre State Park

On occasion, trespassing occurs on the Base by civilian beach users, campers, hikers, mountain bikers, and off-road vehicle operators, which interferes with training operations, the Base's own recreational programs, and natural resource management actions. Unauthorized access continues to adversely impact sensitive habitat, damage trails, roads, and firebreaks and increase the potential for erosion.

During any given year, Camp Pendleton receives any number of requests from outside agencies, business entities, and even individual persons, all asking for some form of access to the Base.

2.5.5 Environmental Encroachment Issues

While the Marine Corps and Camp Pendleton support the conservation of natural resources, particularly sensitive biological resources, conservation planning and natural resource management efforts on Base must provide for *operational flexibility* and avoid the potential for creating preserves on lands specifically established by Congress for military training. The Marine Corps believes that most military activities can be generally compatible with the conservation of sensitive biological resources (Brabham 1995). However, many environmental laws and regulations do not consider the military's unique use of resources and, as written, create conflicts between congressionally mandated military training and congressionally mandated resource management.

The federal Endangered Species Act is a significant environmental law for Camp Pendleton because of the presence of so many federally threatened and endangered species on Base. With the addition of several thousands of acres of potential habitat (currently unoccupied), the percentage of Base lands subject to ESA requirements increases dramatically. Under the ESA, the Base is required to avoid and minimize adverse impacts to federally listed species and their habitats, and to provide compensatory mitigation for impacts that do occur, and to ensure that Base actions do not jeopardize the continued survival of the species.

The designation of critical habitat for federally threatened or endangered species on Base is viewed by the Marine Corps as another encroachment issue. Critical habitat designation identifies geographic areas that are important for the conservation of the species and may require special management considerations, requiring federal agencies to consult with the Service on activities they undertake, fund, or permit that may affect critical habitat. Critical habitat could impede the flexibility that is required to accomplish Camp Pendleton's military mission. Under the Endangered Species Act, the USFWS is required to designate critical habitat upon listing a species as federally threatened or endangered, to the maximum extent prudent. Camp Pendleton's management policy for federal threatened and endangered species is to manage the habitat and ecosystem upon which the species depends to ensure that the

primary constituent elements that are essential for the primary biological needs of foraging, nesting, rearing of young, intra-specific communication, roosting, dispersal, genetic exchange, or sheltering are provided to preclude the need for additional or special management considerations. The designation of critical habitat for federally listed species on Camp Pendleton has been addressed on an individual basis by the USFWS. For some species, areas on Base have been identified as critical habitat whereas, for other species, existing management and training requirements have precluded listing.

Camp Pendleton understands its lands and associated natural resources can and do play a crucial role in regional conservation efforts and stewardship initiatives. Camp Pendleton welcomes its role of responsibly managing its lands and natural resources consistent with current federal policies and regulations. However, local, state, and federal jurisdictions in the region must share an understanding that Base lands have been set aside by Congress specifically for military training, mission support, and preparedness activities in support of National Security mandates. Further, Camp Pendleton's position has always been, and will continue to be, that conservation initiatives in the southern California ecoregion must be shouldered by all stakeholders in the region, with the Base's, vast open spaces and wealth of natural resources, being just one part of that regional conservation strategy.

CHAPTER 3

NATURAL RESOURCES

3.1 PHYSICAL ENVIRONMENT

3.1.1 Climate

The Base has several climatic zones that roughly coincide with the three geomorphic regions present: coastal plain, coastal valley, and mountain. In general, the Base has a semiarid Mediterranean climate with warm, dry summers and mild, wet winters. Daytime temperatures rarely exceed 95° F in the summer and nighttime temperatures usually remain above freezing in the winter.

Seasonal rainfall along the coast averages between 10 and 14 inches per year. Average annual precipitation in the mountains varies between 20 and 40 inches, depending upon slope and elevation. Approximately 75% of the Base's precipitation falls between November and March. Winds generally originate from the west or southwest, carrying in cool, moist offshore air.

Night and early morning clouds throughout the spring and summer characterize the region. Low clouds frequently extend inland over the coastal foothills and valleys but usually dissipate during the morning. Afternoons are generally clear. Coastal fog averages 29 days per year, being heaviest during the fall and winter months.

An important characteristic of local weather is its year-to-year variability. The native vegetation is adapted to periodic drought and flooding. Erosion and sedimentation patterns are influenced by this variability, with most soil loss occurring perhaps once in every 20 years. The pattern of winter storms determines whether there is enough antecedent soil moisture before an intense storm to cause significant soil loss. Intense storms have little impact if the soil is dry enough to absorb water quickly.

“Fire weather” occurs from May through November, with extreme fire conditions occurring when very dry, warm “Santa Ana” winds blow when vegetation is dry and soil protective cover is low. These conditions sometimes result in high erosion rates when intense storms follow a hot fire. Camp Pendleton's geography exacerbates the problem because its northeast-southwest trending canyons are able to pull in marine air each day as land surfaces heat up, creating up-canyon winds. At night, the breezes are pulled back down-canyon and seaward as land surfaces cool (MCB Camp Pendleton 1992).

Local weather and stream gauge data are collected from six stations within the vicinity of the Base: Case Springs, San Mateo Canyon at Tate Grade, Cristianitos, Las Flores, Lake O'Neill, and Range 408. The Cleveland National Forest (El Carrizo Station) and the National Weather Service (Oceanside and San Clemente) also maintain records.

3.1.2 Topography

Camp Pendleton lies within the Peninsular Range of the southwestern geographic region of California. The massive Peninsular Ranges complete the coastal mountain system of California, extending south from the Los Angeles Basin to the tip of the Baja Peninsula, and include the steep, narrow, and northwest trending San Jacinto, Santa Rosa, Agua Tibia, and Laguna Mountains that plunge into the Coachella and Imperial valleys.

The terrain of the Base is varied and includes sandy shores and seaside cliffs, coastal plains and rolling hills, canyons, and mountains rising to elevations of nearly 2,700 feet. Northeast of the coastal hills, the Santa Margarita Mountains average between 1,500 feet and 1,720 feet in elevation. Two major physiographic provinces occur on Base: coastal plains, which rise steeply from the coast inland into fairly level terraces, and the rolling foothills of the Santa Margarita Mountains. The break between these two provinces occurs generally along Basilone Road.

Characteristic of the Peninsular Range, natural erosion over time has formed a series of southwest trending stream valleys across the generally northwest-trending hills and mountains. Each stream has developed its own valley fill deposits, including an alluvial fan at its mouth near the coastline. The marine terraces inland from the coast slope uniformly to the southwest at inclinations of 5% or less. A majority of the Base exceeds 15% slope (Figure 3-1).

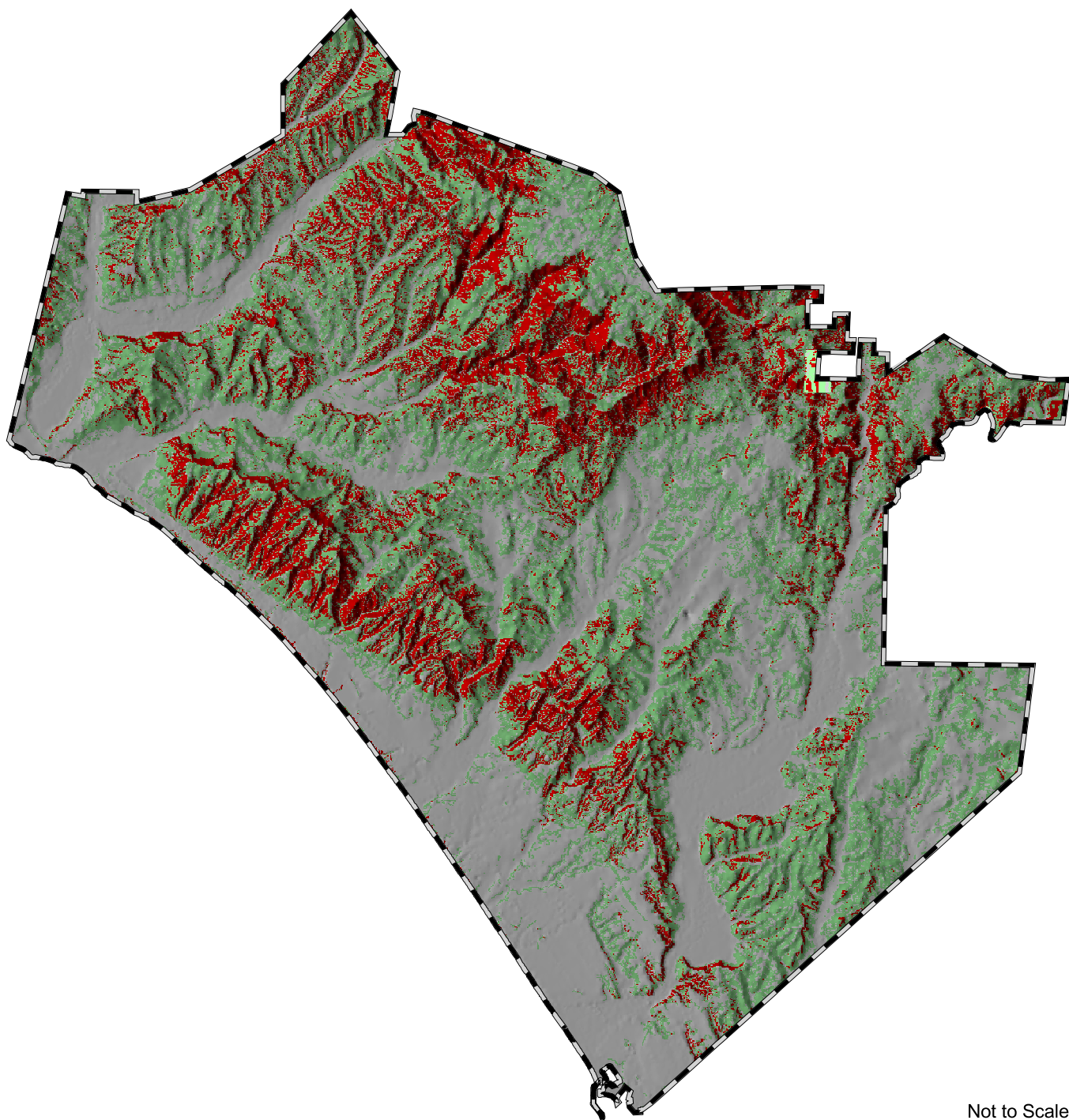
Part of the coastal area consists of steep, low hills that are dissected by the major stream systems of the Base. These are known as the San Onofre Hills. The highest elevation of the range is 1,720 feet, atop San Onofre Mountain. Other areas contain low, wave-cut terraces (mesas) that have distinct cliffs or escarpments along the seaward edge.

East of the San Onofre Hills is gently rolling topography with soils deep and level enough to support some agriculture. They give rise to the Santa Margarita Mountains, part of the Peninsular Range that extends from Orange and Riverside counties to the Mexican border. Margarita Peak, at 3,189 feet, is east of the Base and about ten miles inland from the coast.

3.1.3 Geology and Soils

Camp Pendleton contains diverse geological units, ranging from the oldest metavolcanic rocks and granite of the southern California Batholith to stream- or ocean-cut terrace sequences and recent alluvium. In general, the Base is underlain by Holocene to late Pleistocene (recent to 1 million years before present [mybp]) unconsolidated sedimentary deposits that include alluvium in canyon bottoms and coastal terraces, Eocene to Pliocene (2 to 55 mybp) sedimentary rocks of marine and non-marine origin, and Cretaceous to Triassic (63 to 240 mybp) bedrock that includes highly consolidated and cemented sedimentary rock and plutonic and metamorphic crystalline rock.

Landslides are widespread on Base, particularly within the San Mateo and Cristianitos watersheds, and vary in size from less than an acre to more than a square mile (Blanc &



Not to Scale

Figure 3-1
Slope / Topography



Camp Pendleton Boundary



0 - 15% Slope

16 - 30% Slope

> - 30% Slope



Map Source:
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October 2001



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Cleveland 1968, as cited in MCB Camp Pendleton 1997). This activity is partly due to steep slopes, cover, and climate.

Over fifty soil types are found on Camp Pendleton (Figure 3-2; Appendix L). Soil parent material on the coastal plain consists mostly of poorly consolidated marine sediments, while foothill soils are granitic with some metasedimentary and metavolcanic inclusions. A detailed description of Base soils can be found in the San Diego County Soil Survey (U.S. Soil Conservation Service 1973). The level of resolution for Soil Survey maps is appropriate for preliminary planning purposes only. For activities where soil properties are important, such as construction projects, testing should be done to confirm the nature of the soil on site.

3.1.4 Hydrology

The hydrology of Camp Pendleton is influenced by several factors, including those that are natural (topographic, geologic, climatic, etc.) and human influenced (land use, dams, etc.). Proper management and stewardship of water resources are fundamental to natural resource and land use sustainability. This section provides a cursory overview of fundamental hydrologic features that characterize Camp Pendleton, including watersheds, precipitation, and runoff. Also introduced in this section is Camp Pendleton's water quality, supply, and use.

3.1.4.1 WATERSHEDS

Mountain ranges divide the Base into four main watersheds, or drainage areas (Table 3-1, Figure 3-3): Santa Margarita, Las Flores, San Onofre, and San Mateo. The Las Flores watershed is often divided into subsidiary watersheds, the Las Flores, Coastal, and Aliso. Although the San Luis Rey River drains into the ocean south of the Base, a fraction of this watershed occupies the southern portion of the Base.

The largest drainage, the Santa Margarita, is 742 square miles (474,880 acres). Over 90% of this watershed is off-Base lands. De Luz Creek is an important tributary to the Santa Margarita. Some areas south of the Santa Margarita River drain off Base into the San Luis Rey River. Aliso Creek, Horno Creek, French Creek, Cocklebur Creek, Hidden Creek, Las Flores (with tributaries Las Pulgas and Piedra de Lumbre), and San Onofre Creek (and the Jardine Canyon tributary) are watersheds that are completely on Camp Pendleton and drain into the Pacific Ocean. San Mateo Creek drainage with tributaries Cristianitos and Talega includes areas of the Cleveland National Forest, San Onofre State Park, the City of San Clemente, and other private lands.

The two largest watersheds on Base, Santa Margarita and San Mateo, form broad alluvial plains as they approach the Pacific Ocean. As the streams reach the sea, sloughs or estuarine lagoons form due to sand bars or narrow tidal barriers. These impound low stream flows but are breached during high flows caused by storm events. The blockages subsequently reform by sedimentation and normal wave action. The three largest estuaries on the Base are situated at the mouths of the Santa Margarita, Las Flores, and San Mateo streams.

TABLE 3-1. Principal watersheds: acreage and percent occupation occurring on Camp Pendleton.^a

Watershed	Approximate Acreage on Base	Approximate Total Acreage of Watershed	Percent of Watershed on Base
Aliso	11,400	11,400	100
Coastal	9,800	9,800	100
Las Flores	16,900	16,900	100
San Luis Rey	9,100	357,120	2
San Mateo	18,200	87,680	21
San Onofre	27,520	27,520	100
Santa Margarita ^b	31,200	474,880	7

^a Only the major watershed groups are presented (several smaller systems may be lumped into a single watershed system).

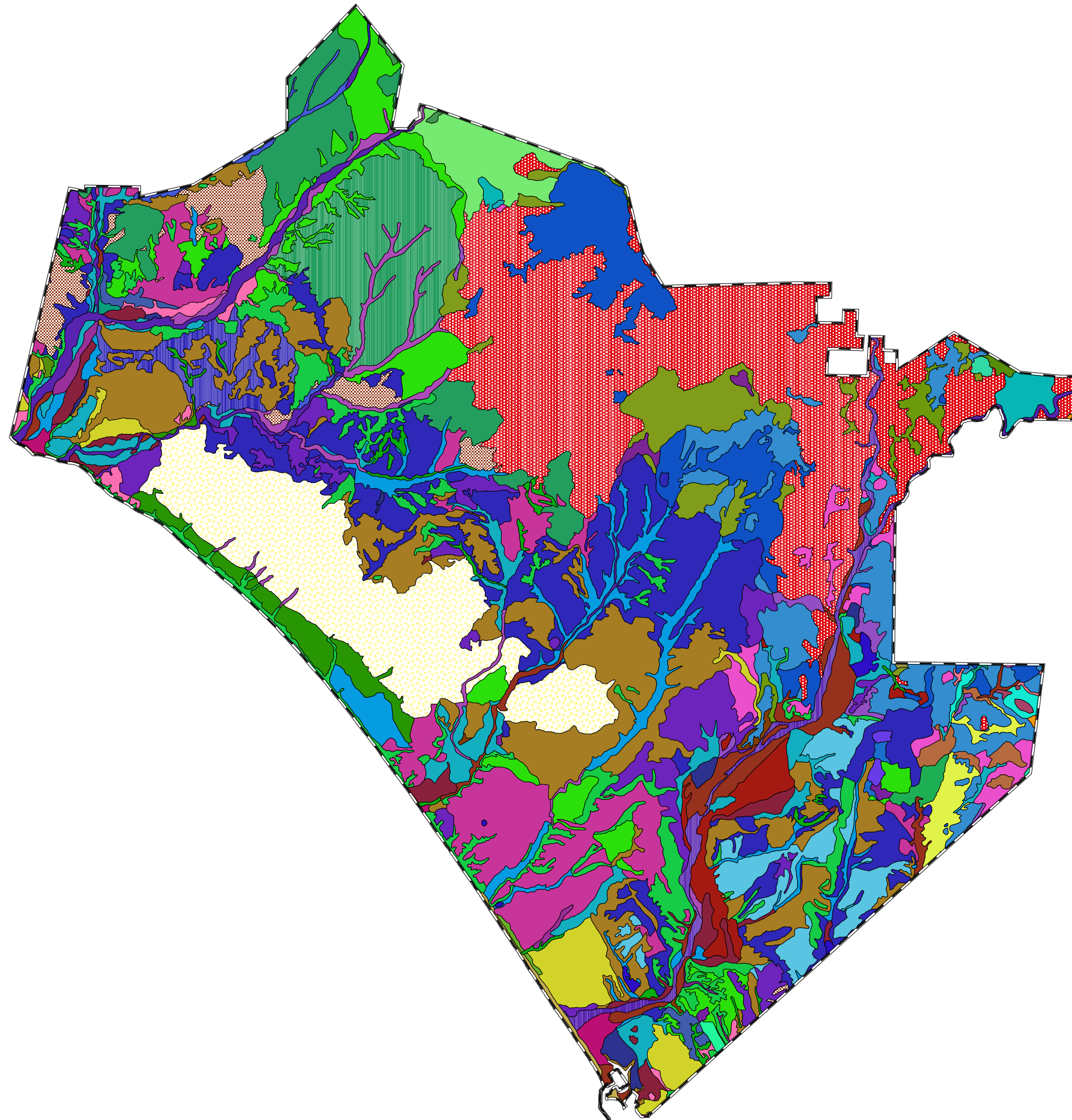
^b Santa Margarita watershed acreage includes the southernmost portion of the Deluz Creek watershed which occurs on Base.

Headwaters for the four main watersheds of Camp Pendleton originate on the western slopes of the Peninsular Ranges. Flowing southwesterly to the Pacific Ocean from the Santa Ana and Santa Margarita Mountains and the Santa Rosa Plateau is the largest stream system, the Santa Margarita River. Below the confluence of Murrieta and Temecula Creeks, the Santa Margarita is southern California's only "free-flowing" river with no major dams. Activities of the nonmilitary ownership of these drainages (Table 3-1) affects water quality and sedimentation issues for the Base.

The two smaller watersheds to the north, San Onofre and Las Flores, are completely contained within the Base. Las Flores Creek is formed less than a mile from the Ocean where Las Pulgas Creek and Piedra de Lumbre Creek come together. At the most northern portion of the Base is the San Mateo Creek watershed.

The alluvial valleys in the lower portions of these four watersheds contain the principal source of water for the Base (MCB Camp Pendleton 1986). These groundwater basins were evaluated for their "safe yield" of potential water, which is the amount of groundwater that can be extracted without detrimental effects to the basin (Leedshill-Herkenhoff 1989). All of the Base's well production in the Santa Margarita River watershed is from the younger alluvium (Jenks 1993).

Figure 3-2 Soil Types



— Camp Pendleton Boundary

- Acid igneous rock land
- Altamont clay
- Blasingame loam
- Bonsall sandy loam
- Bosanko clay
- Carlsbad gravelly loamy sand
- Carlsbad-Urban land complex
- Chesterton fine sandy loam
- Cienaba coarse sandy loam
- Cieneba rocky coarse sandy loam
- Cieneba very rocky coarse sandy loam
- Cieneba-Fallbrook rocky sandy loams
- Coastal beaches
- Diablo clay
- Diablo-Olivenhain complex
- Elder shaly fine sandy loam
- Escondido very fine sandy loam
- Exchequer rocky silt loam
- Fallbrook rocky sandy loam
- Fallbrook sandy loam
- Fallbrook-Vista sandy loam
- Friant rocky fine sandy loam
- Gaviota fine sandy loam
- Grangeville fine sandy loam
- Greenfield sandy loam
- Hambright gravelly clay loam
- Huerhuero loam
- Huerhuero-Urban land complex
- Las Flores loamy fine sand
- Las Flores-Urban land complex
- Las Posas fine sandy loam
- Las Posas stony fine sandy loam
- Linne clay loam
- Loamy alluvial land-Huerhuero complex
- Made land
- Marina loamy coarse sand
- Olivenhain cobbly loam
- Olivenhain-Urban land complex
- Placentia sandy loam
- Placentia sandy loam, thick surface
- Ramona gravelly sandy loam
- Ramona sandy loam
- Reiff fine sandy loam
- Riverwash
- Rough broken land
- Salinas clay
- Salinas clay loam
- Steep gullied land
- Stony land
- Terrace escarpments
- Tidal flats
- Tujunga sand
- Visalia gravelly sandy loam
- Visalia sandy loam
- Vista coarse sandy loam
- Vista rocky coarse sandy loam
- Water



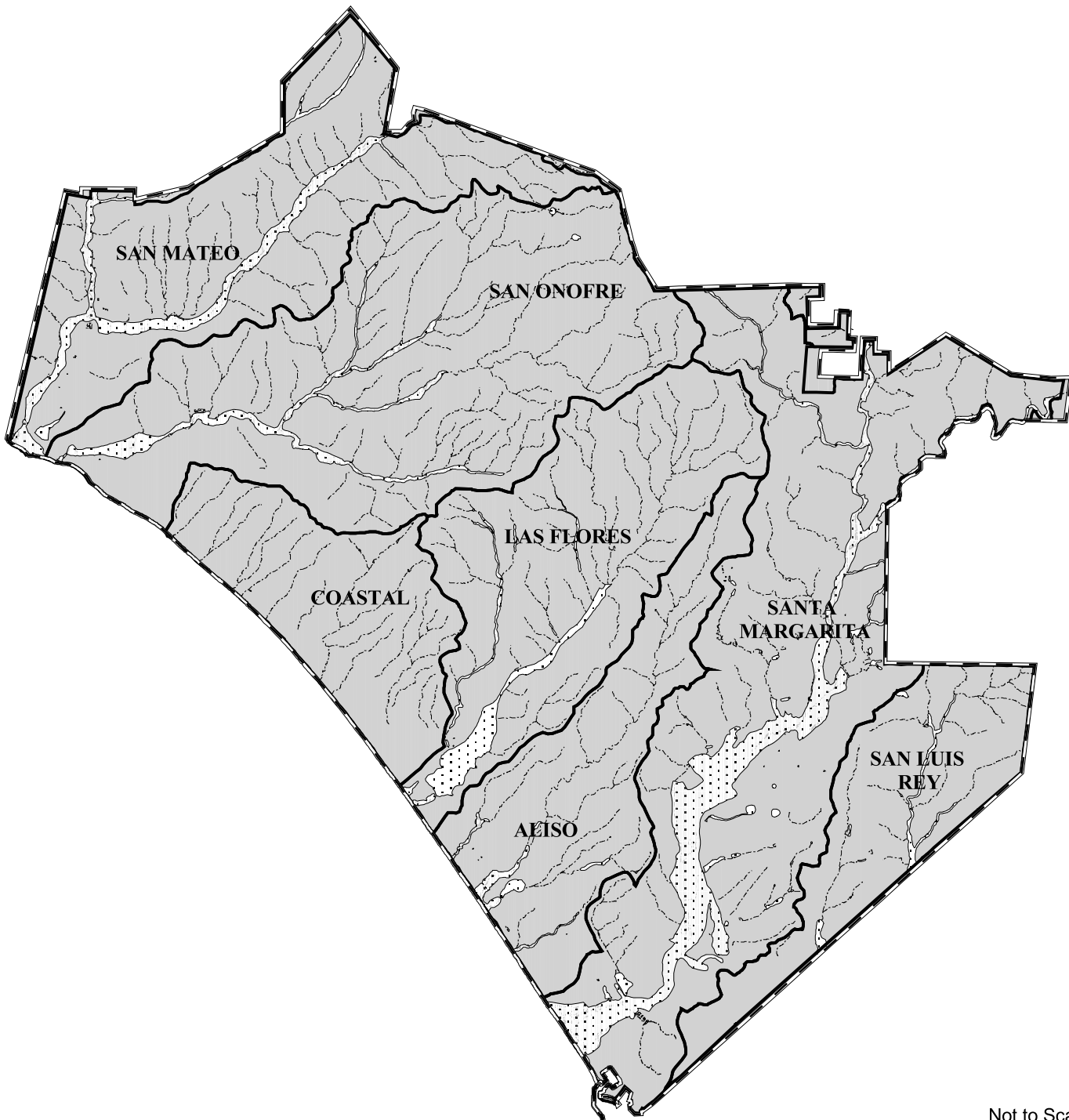
Map Source:
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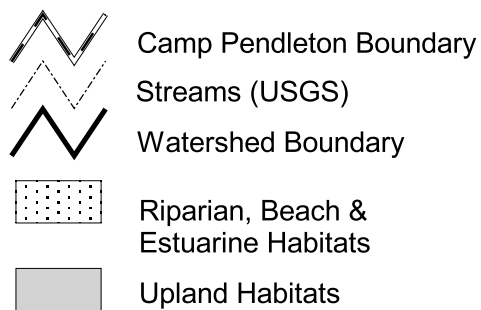
Integrated Natural Resources Management Plan

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**Figure 3-3
Watersheds**



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GIS Branch
October 2001



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3.1.4.2 PRECIPITATION AND RUNOFF

Over one hundred years of precipitation records (up to 1990) for the lower area of the Base (Table 3-2) reveal an average of 13.47 inches of precipitation per year, with a minimum of 4.51 inches (in 1960-61) and a maximum of 34.40 inches (1977-78). However, in 1993, a year with serious flooding, rainfall was estimated to have reached 42.0 inches (Malloy, pers. comm. 1994). In the mountains at Case Springs (at 2300 ft. elevation), the 1965-1993 records indicate an average precipitation of 23.02 inches, with a minimum of 10.05 (1980-81) and a maximum of 50.42 inches (1968-69).

The variability in annual runoff for the major streams on the Base is shown in Table 3-2 below. Discontinuous collection of flow data, however, hinders the accuracy of some of these historical records.

The potential is particularly high for large floods on Camp Pendleton because of the extreme variability of runoff and precipitation. Successive soil-saturating storms in early 1993, combined with intense rainfall (6.8 inches in 24 hours) in the upper watershed, led to record flooding in the Santa Margarita River on January 16. At the damaged gaging station at Ysidora, the estimated peak discharge of 45,000 cubic feet per second (cfs) was the highest in 68 years of record keeping, exceeding the previous record (February 16, 1927) by about 12,000 cfs or 34% (Bowers 1993).

TABLE 3-2. Recent hydrologic records for gaging stations on or near Camp Pendleton.

Stream Gage Station	Period of Record (water year or month/year)	Minimum Runoff (acre-feet)	Maximum Runoff (acre-feet)	Average Runoff (acre-feet)
San Mateo Creek near San Clemente ^a	1953 - 76; 1990 - 1993	13	62,699	8,230
Santa Margarita River near Fallbrook ^b	10/24 - 1/80; 9/89 - 9/93	1,410	159,000	19,940
Santa Margarita River at Ysidora ^b	3/23 - 9/93	0	244,400	25,012
De Luz Creek near Fallbrook ^{a,b}	2/51 - 9/76; 9/89 - 9/93	0	31,286	3,970
Fallbrook Creek near Lake O'Neill ^a	10/64 - 9/76; 10/89 - 9/93	32	6,247	1,491
San Onofre Creek at San Onofre ^{a,b}	1952 - 1976;	0	14,684	1,581

^a AC/S Environmental Security records, Camp Pendleton.

^b U.S. Geological Survey records. (Several of the active gage stations were temporarily out of commission as a result of the January 1993 flood and flows were estimated in the interim.)

The 100-year peak flow at this gage station is estimated (for flood control purposes) to be 100,000 cfs (assuming upstream storage sites are full), with a total five-day flood volume predicted to be 144,000 acre-feet (Leedshill-Herkenhoff 1989). Peak discharges will likely increase in future years due to the effects of expanded urbanization in the upper watershed.

During the summer months, the frequency of extremely low flows in unregulated streams is particularly high throughout Camp Pendleton. It is not unusual for the San Mateo, San Onofre, and Los Flores Creeks to be dry from July through October. The Santa Margarita River has had no flow reaching the Ocean during about 26% of the period of record (Leedshill-Herkenhoff 1989).

3.1.4.3 FLOODPLAINS AND SURFACE WATERS

A flood evaluation completed in 1989 concluded that, under existing conditions, the 100-year flood would inundate almost all of the developed areas near the Santa Margarita River, except the Naval Hospital, Sewage Treatment Plant No. 3, and the Ranch House. This flood channel is about 1000 feet wide, compared to a low flow channel of less than 100 feet, and covers most of the valley floor where the River traverses the Base (Leedshill-Herkenhoff 1989).

Severe channel-bed scour to a depth of at least 10 feet below the riverbed had previously removed one of the Basilone Road bridge footings during a 21,200 cfs flood in the winter of 1978 (Chang 1988). Before the January 1993 flood, it was predicted that the existing bridges at Basilone Road and Stuart Mesa Road would be overtopped by a 100-year flood at 100,000 cfs and that a non-damaging flood would have to be less than 11,000 cfs (Leedshill-Herkenhoff 1989). The 1993 flood of an estimated 45,000 cfs at Ysidora was about a 25-year flood event (based on the most recent flow frequency table). It destroyed the bridge at Basilone Road and damaged the Stuart Mesa Road Bridge.

Damage was exacerbated in 1993 because immense amounts of sediment and debris, estimated at 300,000 cubic yards and largely from off-Base sources, were deposited on the wide, flat floodplain of the Santa Margarita River, as the flood passed through Camp Pendleton (California Regional Water Quality Control Board 1993). In addition to the loss of bridges, railroad tracks were washed out and the Air Station was severely impacted by sedimentation. Drinking water quality was in question as a result of the flood's impact on the water supply wells within the floodplain and some of the sewage treatment plants were flooded and retention ponds destroyed.

Concern has been raised that more frequent and damaging flood events could be experienced on the Base because of the effects of increased upstream urbanization in the Santa Margarita Watershed. Previous damaging floods have occurred at Camp Pendleton in 1951-52, 1956, 1968-69, 1978, and 1980 (Leedshill-Herkenhoff 1992).

While two major dams, at Vail Lake and Skinner Reservoirs, are located far upstream in the Santa Margarita watershed, Camp Pendleton has only a low flow impoundment on this river that is used to divert water into Lake O'Neill. This small lake was constructed originally in

1883 on Fallbrook Creek (a tributary) to store water for farm irrigation. Since it came into use for the Base, the lake's purpose has been primarily to supplement the water supply and secondarily to provide recreation. This reservoir has a capacity of 1,200 acre-feet and is dependent on the Santa Margarita River (through the O'Neill Ditch diversion), Fallbrook Creek, and rainfall runoff as its water sources. To help recharge downstream aquifers, its stored water is released each fall into percolation ponds near the gaging station (Leedshill-Herkenhoff 1989).

In addition, small ponds are located throughout the Base, including: Case Springs and Witman Pond (both in San Onofre watershed); Pulgas Lake (Las Flores watershed); Broodmare Pond, Pilgrim Creek Pond, Horseshoe Lake, and Windmill Lake (San Luis Rey watershed); Wildcat Ponds and India Ponds (all in Santa Margarita watershed).

3.1.4.4 WATER QUALITY, SUPPLY, AND USE

Frequent low flow conditions in the Base's streams can concentrate and exacerbate natural and human-caused water quality problems. While certain water quality objectives set by the State through the San Diego Regional Water Quality Control Board have sometimes been exceeded, the quality of Camp Pendleton's drinking water presently meets the mandatory health-related standards established by the California Department of Health Services under Title 22 of the Health and Safety Code (MCB Camp Pendleton 1993a).

Data from surface water quality monitoring stations indicate that the Santa Margarita River's water contains excessive total dissolved solids (TDS) and nitrate, and increasing concentrations of magnesium and sulfate. Groundwater quality in the Base's wells near this river is impacted by TDS levels above California water quality objectives and threatened by increasing levels of nitrate, sulfate, and chloride (Leedshill-Herkenhoff 1989). Upstream users greatly affect the Base's water quality since Camp Pendleton is the last water user on the extensive Santa Margarita River system. Nutrient levels, particularly nitrogen, have increased in recent years due to intensive agricultural use of fertilizers in the upper watershed. In addition, a dramatic expansion of residential, commercial, and industrial development during the past decade in the upper part of the drainage has produced more urban runoff and wastewater discharge.

For the other three major drainages on the Base, fewer sampling data are available. However, surface water samples indicate that Las Flores, San Onofre and San Mateo Creeks all have had TDS levels that at some point exceed the Regional Water Quality Control Board's objectives. San Mateo Creek's quality also exhibits excessive sulfate and nitrate concentrations. While drinking water standards for groundwater are met for most constituents in the three drainages, recurring problems have been noted for TDS, conductivity, nitrate, iron, sodium, and coliform (*E. coli*). Data have not indicated any long term trends. (Leedshill-Herkenhoff 1989).

Concern is always present about potential seawater intrusion into the Base wells if the water extraction exceeds the safe yield of the individual basins (MCB Camp Pendleton 1986). Frequent monitoring and extraction control of key wells appears to have helped prevent such

contamination from occurring in recent years. Historically, however, the Ysidora Narrows well in the Santa Margarita River Basin showed evidence of seawater advance as far as 3 miles upstream by 1952 due to pumping in the basin (California Department of Water Resources 1956). By maintaining a five foot level static water level at this critical well site, seawater intrusion has apparently been avoided. Increased chloride concentrations at this site and at a well in the San Onofre Creek Basin may have also been caused by increased pumping from lower quality strata and decreased fresh water recharge (Leedshill-Herkenhoff 1989). Salt-load imbalances in each of the groundwater basins was noted to have increased dramatically from 1964 to 1976 and were projected to increase in Santa Margarita Basin due to further development upstream (PRC Engineering, Inc. 1983).

Excessive levels of sediment, particularly in the Santa Margarita River, are another water quality problem. Until the 1993 flood, studies had predicted that the Santa Margarita would be a low sediment producer due to its lower average rainfall and higher percolation rates compared to other large rivers in the region (Brownlie & Taylor 1981). In January 1993, intensive rainfall in the headwaters, combined with over 5,000 acres of bare ground from unfinished and unprotected construction sites, helped yield a river of "liquid sandpaper" which scoured channels and left four- to eight-foot deposits of sand and gravel in the Camp Pendleton floodplain and estuary, despite several upstream dams trapping sediment (California Regional Water Quality Control Board 1993; Bell 1993).

Hazardous waste contamination has been detected in soil and shallow groundwater on the Base but not in the deep aquifer supplying drinking water. Groundwater monitoring reveals that no contamination has migrated off the Base's property. In 1989, Camp Pendleton was placed by the U.S. EPA on the National Priorities List for cleanup of hazardous waste. Contamination is from solvents, metals, petroleum, and other wastes contributed by past waste handling and disposal practices on the Base. A cleanup program is currently in operation (MCB Camp Pendleton 1993b).

Camp Pendleton's domestic, agricultural, and industrial water supply is totally dependent on pumping from underground aquifers located on the Base that are recharged by percolation from overlying rivers and streams. At present, Camp Pendleton does not rely on imported water, unlike most other water systems in Southern California.

Santa Margarita River wells provide water to the Headquarters Area, Naval Hospital, Camp Del Mar, and all points in-between, representing about 65% of the total water consumed on the Base. The Las Flores Creek wells produce water for Camp Pulgas and Camp Las Flores, while the San Onofre Creek well water is delivered to Camp Horno and Camp San Onofre. Camps Talega, Cristianitos, and San Mateo; the San Onofre Housing, School, and Trailer Park; and the 51 area Marine Corps Exchange complex are all served by wells from San Mateo Creek (MCB Camp Pendleton 1993a). Agricultural wells supply irrigation water for leased sites of about 700 acres in the Stuart Mesa area and 600 acres in the San Mateo area.

Since complete well production records began in 1944, total annual water use has ranged from a low of 5,850 acre-feet (1991) to a high of 10,656 acre-feet (1979). While total use averaged 8,066 acre-feet over this 50-year period, well production during 1991-1993 was significantly lower, averaging 6,311 acre-feet, or a 22% reduction. Military consumption

represents an annual average of 5,910 acre-feet (73% of the total), while agricultural irrigation use (on leased sites) amounts to 2,156 acre-feet (27%). Fluctuation in use is related to water conservation efficiency during drought years, troop mobilization levels, water system leaks, crop water needs, and other factors.

3.1.5 Fire

Fire has a strong influence on the biological structure and composition of Camp Pendleton's vegetation. It can play a positive, even necessary, role in the maintenance of native vegetation and natural community structure. Fires can create a mosaic of seral stages within a particular vegetation community that promotes habitat diversity. However, the fire frequency at some locations on Camp Pendleton is higher than other areas in southern California (MCB Camp Pendleton 1998). A high fire frequency can permanently change the vegetation type (type conversion) of a given site by suppressing it to a lower seral stage. The use of pyrotechnics and live-fire ammunition by the military during training creates this additional risk of fire occurrence relative to other areas of southern California.

Zedler et al. (1997) states that anthropogenic causes of fire in southern California are not a recent phenomenon. In fact, it appears that prehistoric humans played an active and significant role in elevating fire frequency (Zedler et al. 1997). Early native Americans, as well as the Spanish and Mexican settlers of the region, regularly used fire as a tool to clear brush to facilitate hunting and to promote grazing (Rasmussen & Woodman 1997). Cattle grazing and, later, crop cultivation continued on the former *Rancho Santa Margarita y Las Flores* (now Camp Pendleton) until the U.S. Government acquired the land in 1942.

While fire ignitions and burn frequency at Camp Pendleton are much higher today than at the time the military acquired the property, burn patterns may reflect prehistoric ones more closely than those resulting from fire suppression policies in southern California (Minnich 1983). Vegetative, topographic, and climatic factors in the region have also favored fire since the emergence of the Mediterranean climate hundreds of thousands of years ago.

3.2 BIOLOGICAL ENVIRONMENT

Southern California is one of the most biologically diverse regions in the continental United States. It supports a variety of habitat types and contains the greatest number of plant and wildlife species identified by the federal government as threatened or endangered (Dobson et al. 1997). Natural resources on Camp Pendleton reflect the rich diversity of species and habitat types formerly present within the region. The great diversity and abundance of plant and wildlife resources on Camp Pendleton provide many ecological, aesthetic, recreational, and military values to the Base, its residents, and the general public.

This section provides an introduction to the diversity of plant and wildlife species (including descriptions of federally listed threatened and endangered species) found on Camp Pendleton. Plant communities are also introduced in this section; however, greater description of these is provided in Appendix M. A discussion of the value that vegetation and

land cover provide to the training mission of Camp Pendleton is also presented. Included in this section is also a discussion of the importance, and present situation, of landscape linkages and corridors.

Nomenclature used within this document follows CalFlora (2000) for plants, Holland (1986) for vegetation types (plant communities), and California Wildlife Habitat Relationships System (CDFG 1999) and the California Natural Diversity Database (CDFG 2000a) for amphibians, birds, mammals, and reptiles. References to basewide survey efforts assume exclusion of restricted areas (i.e., Central Impact Area for safety reasons) and, depending upon the species, may assume efforts were focused within areas of potential habitat (e.g., surveys for beach species are conducted within beach habitats).

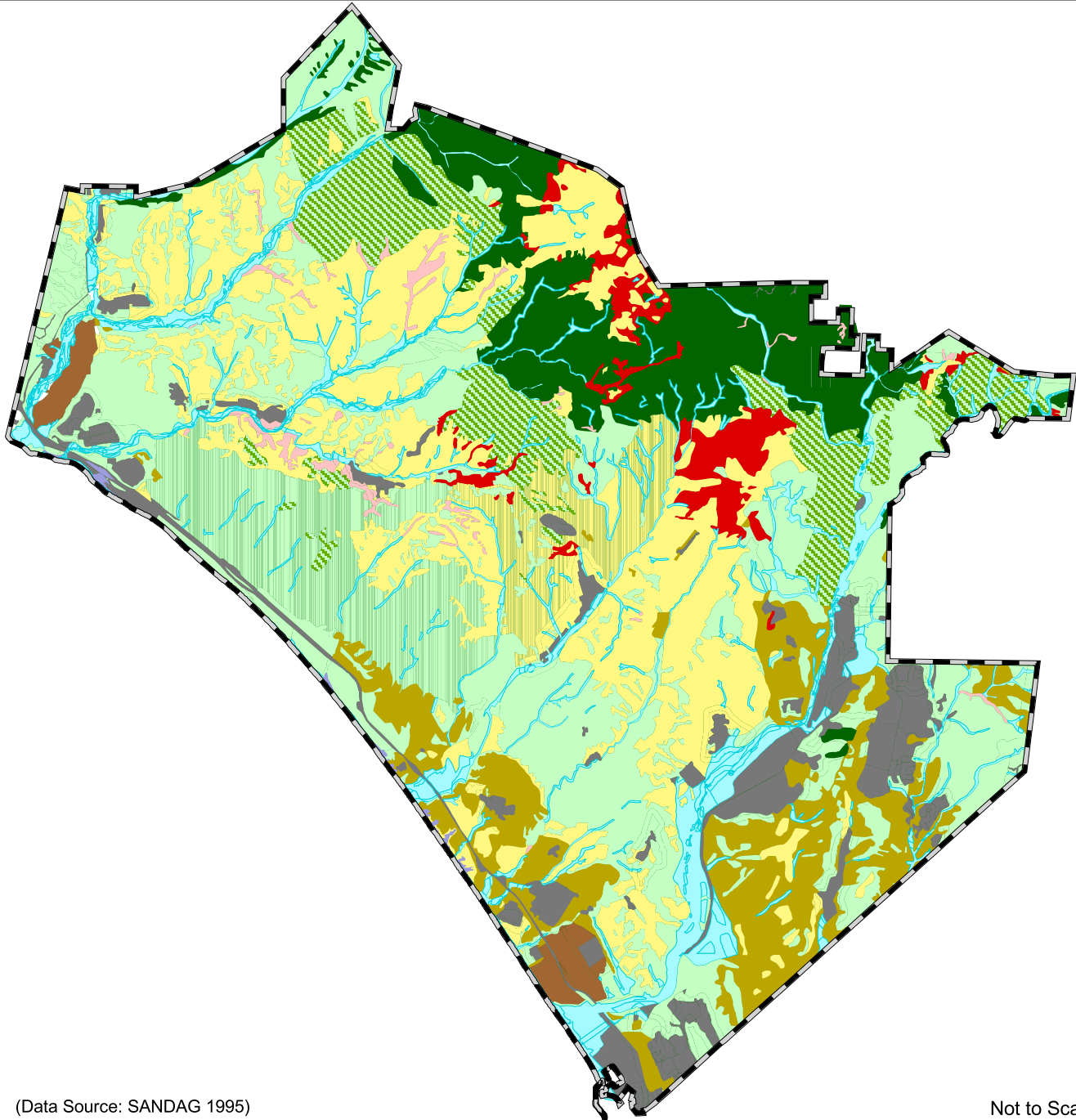
3.2.1 Plant Species and Communities

Camp Pendleton supports high quality, and in some instances, the last, remaining intact stands of sensitive habitat types in coastal southern California. Zedler et al. (1997) described and mapped 21 native and nonnative vegetation types on Camp Pendleton. Major vegetation types are presented in Figure 3-4 and descriptions are provided in Appendix M. Most of these vegetation types are recognized in the classification system developed by Holland (1986).

Rare plant surveys were first conducted on the Base in 1986 (PSBS 1986). Since then, additional rare plant surveys have been conducted in 1987 (PSBS 1987), 1988 (PSBS 1988), 1990 (PSBS 1990), 1993-1996 (Dudek & Associates 1993, 1996; Zedler & Bliss 1993), and 1997 (RECON 1999). Some of these surveys were conducted basewide, while others focused on selected portions of the Base. Over the years, approximately 818 plant species have been identified on Camp Pendleton (Table 3-3). A comprehensive plant list is presented in Appendix N. In addition to numerous rare plant species, three federally listed threatened or endangered plant species are known to exist on Camp Pendleton: thread-leaved brodiaea (*Brodiaea filifolia*), spreading navarretia (*Navarretia fossalis*), and San Diego button-celery (*Eryngium aristulatum* var. *parishii*). (See Section 3.2.3 for detailed descriptions of each federally listed species on Camp Pendleton.)

A number of rare and sensitive plant species that are known to occur in the region, including Encinitas baccharis and San Diego thornmint, have not been identified on Camp Pendleton to date. The Base will continue to look for and document occurrences of rare plants through basewide and project-level survey efforts.

Most of the plants on Base are considered native to the region, but as many as 20% (Table 3-3) are exotic (nonnative), often invasive species that in some cases have become naturalized since European settlement. These nonnative species are believed to have displaced some native plant species in the region. One historical account of the area (formerly *Rancho Santa Margarita y Las Flores*) from 1829 described wild (summer) mustard as a “terrible scourge” attaining heights of as much as three meters and claimed that it could not be controlled by human means or fire (Engstrom 1996).



-  Camp Pendleton Boundary
-  Agriculture
-  Coastal Bluff Scrub
-  Coastal Sage Scrub
-  CSS - Chaparral Mix
-  Chaparral
-  Coast Live Oak Woodland
-  Englemann Oak Woodland
-  Native Grassland
-  Nonnative Grassland
-  Riparian and Estuarine/Beach
-  Developed Areas
-  Disturbed/Ruderal

Figure 3-4
Major Vegetation Types



Map Source:
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GIS Branch
October 2001



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Some of the exotic invasive plant species that occur on Base include giant reed grass (*Arundo donax*), artichoke thistle (*Cynara cardunculus*), perennial pepperweed (*Lepidium latifolium*), mustard (*Brassica* spp.) fennel (*Foeniculum vulgare*), iceplant (*Mesembryanthemum crystallinum*), tamarisk (*Tamarix parviflora*), and tree tobacco (*Nicotiana glauca*).

TABLE 3-3. Number of native and nonnative plant species at Camp Pendleton, grouped by vegetation type.

Vegetation Type ^a	# Native Species	# Nonnative Species	TOTAL
Grasses	73	40	113
Vines	0	1	1
Ferns	20	0	20
Herbs ^b	409	103	512
Herb/Vine	17	2	19
Herb/Shrub	3	1	4
Shrubs	102	5	107
Shrub/Vine	4	0	4
Shrub/Tree	11	5	16
Trees	19	3	22
TOTAL	658	160	818

^a Categories accommodate plant species that are classified as having more than one plant form (see Appendix N).

^b Not including grasses.

3.2.1.1 USE OF VEGETATION COMMUNITIES BY MILITARY TRAINING

The diversity of natural vegetative cover enhances the realism of military training and is one of the reasons Camp Pendleton supports a wide variety of training. This section provides a summary of, the use of major vegetation types for military training.

Beach and Dune Communities

Beach communities are high value for training, due to the amphibious mission of the Marine Corps. Beach environments provide opportunities for amphibious landings. These landings involve simulating mine sweeps, securing defensive positions, and establishing encampments and staging areas ashore. In this type of training Marines learn to maneuver vehicles and equipment through the surf zone and wet and dry sand. Training activities at the Base's foredune community at White Beach and the Santa Margarita estuary have been restricted to protect nesting areas for the Federally endangered California least tern and the western snowy plover.

Shrublands (Includes Sage Scrub, Chaparral, and Bluff Scrub)

Shrublands can be difficult for wheeled vehicles and foot mobile troops to maneuver through and therefore provides valuable training opportunities in route selection and command and control. Vehicles and troops may have difficulty in traversing shrublands depending on terrain (which can be quite steep), size of vehicle, and density and size of the vegetation. In addition, shrublands provide good opportunities to practice concealment and camouflage skills since the vegetation is often not tall enough to hide a standing person or vehicle. Large areas of coastal sage shrublands are occupied by the federally threatened California gnatcatcher. This restricts activities year round that may impact habitat, and seasonal activities that may impact nesting birds.

Riparian

Military training in these areas is restricted due to wetlands regulations and the presence of endangered species. When available, riparian habitats provide realistic training for using covered and concealed avenues of approach for small units through the tall dense vegetation, mud and water. They are currently used to a very limited extent for foot activities.

Grasslands

Open grasslands are allow tracked and motorized units to fire and maneuver cross country. The terrain is usually flat to gently rolling and therefore provides many maneuver opportunities, as well as visibility for reconnaissance and observation for indirect fire.

Oak Woodlands

Oak woodlands provide excellent opportunities for concealment and camouflage. Sparse woodlands provide opportunities for mechanized units to maneuver whereas in more heavily forested areas these units are forced to use roads.

Coastal Salt Marsh

Military forces would seldom choose to advance through marshes if they could be avoided, because of the restrictions to movement imposed by the swampy conditions. Nevertheless these habitats provide training opportunities for military planners on how to avoid restrictive terrain.

3.2.2 Wildlife Species

Wildlife species on Camp Pendleton are important to the functioning of ecosystems and provide many benefits to humans. Some animals disperse seeds, while others consume

insects and rodents considered harmful to humans. Others provide recreational opportunities, such as hunting, fishing, and bird watching.

The large undeveloped portions of Camp Pendleton support a variety of wildlife species. In addition to hundreds of invertebrates, the Base has documented the presence of more than 50 mammalian, 30 reptilian, 10 amphibian, 300 avian, and 60 fish species (see Appendix O for list of wildlife species that have been seen on Camp Pendleton). Species of special concern that have been identified by various agencies and organizations are identified in Appendix O. Additional wildlife species certainly occur, but few financial resources are available to adequately survey for them, especially among the invertebrates.

Many wildlife species are resident on the Base and can be found throughout the year. While other wildlife species visit the Base seasonally, such as migratory birds like the least Bell's vireo, or periodically, such as the mountain lions and golden eagles that come and go as they travel throughout their large home ranges.

Most of the wildlife species on Base are considered native to the region, but many are also exotic. As with the plants, some exotic wildlife species are invasive and may be causing the decline or local extirpation of native species (e.g., as a result of competitive exclusion, habitat alteration, predation, nest parasitism, etc.). Examples of nonnative wildlife species on Base include the beaver (*Castor canadensis*), brown-headed cowbird (*Molothrus ater*), bullfrog (*Rana catesbeiana*), red swamp crayfish (*Procambarus clarkii*), Argentine ants (*Iridomyrmex humilis*), and several exotic fish species (e.g., mosquitofish [*Gambusia affinis*], carp [*Cyprinus carpio*], black bullhead [*Ameiurus melas*], and green sunfish [*Lepomis cyanellus*]).

Among the many native wildlife species for which Camp Pendleton provides habitat are 2 mammalian, 1 amphibian, 8 avian, 2 fish, and 2 invertebrate federally listed threatened or endangered wildlife species (see Section 3.2.3 for a description of each species). A number of other federally listed threatened or endangered wildlife species are known to occur in the region, such as the quino checkerspot butterfly, but have never been identified on Camp Pendleton. Other federally listed threatened or endangered wildlife species, such as the red-legged frog, have been historically recorded on Base, but not in more recent survey efforts. A majority (91 %) of avian species on Base are included on the list of migratory birds (50 CFR 10.13) protected by the Migratory Bird Treaty Act and Executive Order (EO) 13186.

Five California listed threatened and endangered species and over 55 California listed Species of Special Concern are also found on Camp Pendleton. Included in these are: the Swainson's Hawk (California threatened); Western Yellow-billed cuckoo (California endangered) also recently added as a federal candidate species; Belding's Savannah Sparrow (California endangered); Peregrine Falcon (California endangered) recently delisted by USFWS; Bank Swallow (California threatened); Two-striped Garter Snake (California protected); Southwestern Pond Turtle (California protected); San Diego Horned Lizard (California protected); and Orange-Throated whiptail (California protected).

3.2.3 Federally Listed Threatened and Endangered Species at Camp Pendleton

Eighteen (18) federally threatened or endangered species are found on, or transit through, Camp Pendleton (Table 3-4). Although Camp Pendleton provides habitat for 18 of San Diego County's 38 federal threatened or endangered species, it encompasses less than 4.6% of total land area of San Diego County.

TABLE 3-4. Federally listed threatened and endangered plant and wildlife species at Camp Pendleton.

Common Name	Scientific Name
Birds	
Bald Eagle ^a	<i>Haliaeetus leucocephalus</i>
Brown Pelican ^b	<i>Pelecanus occidentalis</i>
California least tern	<i>Sterna antillarum browni</i>
Coastal California Gnatcatcher	<i>Poliophtila californica californica</i>
Least Bell's Vireo	<i>Vireo bellii pusillus</i>
Light-footed Clapper Rail ^c	<i>Rallus longirostris levipes</i>
Peregrine Falcon ^d	<i>Falco peregrinus anatum</i>
Southwestern Willow Flycatcher	<i>Empidonax trailli extimus</i>
Western Snowy Plover	<i>Charadrius alexandrinus nivosus</i>
Mammals	
Pacific Pocket Mouse	<i>Perognathus longimembris pacificus</i>
Stephens' Kangaroo Rat	<i>Dipodomys stephensi</i>
Fish	
Southern Steelhead Trout ^e	<i>Oncorhynchus mykiss</i>
Tidewater Goby	<i>Eucyclogobius newberryi</i>
Amphibians	
Arroyo Toad	<i>Bufo californicus</i>
Crustacean	
Riverside Fairy Shrimp	<i>Streptocephalus woottoni</i>
San Diego Fairy Shrimp	<i>Branchinecta sandiegonensis</i>
Plants	
San Diego Button-Celery	<i>Eryngium aristulatum</i> var. <i>parishii</i>
Spreading Navarretia	<i>Navarretia fossalis</i>
Thread-Leaved Brodiaea	<i>Brodiaea filifolia</i>

^a Known to occasionally transit the Base. The bald eagle has also been proposed for delisting in the lower 48 United States (USFWS 1999a).

^b Known to frequently transit the Base.

^c Only unpaired (possibly transient) light-footed clapper rails have been observed on Camp Pendleton since 1988 (Zemba & Hoffman 2000).

^d The peregrine falcon was recently delisted (USFWS 1999b).

^e The southern steelhead trout recently rediscovered upstream of the Base on the San Mateo Creek and is pending listing for the Camp Pendleton area.

Management of federal threatened and endangered species is conducted through the implementation of habitat based management plans for riparian, estuarine, coastal, and upland areas (Estuarine and Beach Ecosystem Conservation Plan [Appendix D], the Riparian Ecosystem Conservation Plan [Appendix E] and the Listed Upland Species Management Program [Appendix F]). These management plans are based on programmatic Biological Assessments and Biological Opinions, which contain the goals, objectives, and terms and conditions for managing federally listed species on Camp Pendleton.

Because federally listed threatened or endangered species present a special concern for wildlife management, Camp Pendleton regularly surveys and maps the location and distribution of these species and sensitive habitats (Figure 3-5; see also Appendix P for the tracking of USFWS Recovery Plan downlisting criteria and Camp Pendleton's contribution). Information from these surveys is updated periodically and disseminated to Camp Pendleton land and resource managers and resource agencies. Not represented on Figure 3-5 are the bald eagle, the brown pelican, and the light-footed clapper rail. It is important to note that federally listed species are not surveyed within the Central Impact Area due to safety concerns.

3.2.3.1 BALD EAGLE

Status. – The USFWS listed the bald eagle (*Haliaeetus leucocephalus*), as endangered in the lower 48 states on 11 March 1967 (USFWS 1967). On 12 July 1995 the USFWS reclassified the bald eagle from endangered to threatened as a result of significant increase in numbers of nesting pairs, increased productivity and expanded distribution (USFWS 1995b). On 6 July 1999 the USFWS proposed to remove the bald eagle from the list of endangered and threatened species (USFWS 1999a). This proposal has not been finalized, nor has critical habitat been designated; however, a recovery plan for the bald eagle has been approved (USFWS 1986a).

Distribution and Occurrence. – The bald eagle ranges throughout much of North America, nesting on both coasts from Florida to Baja California, Mexico in the south and from Labrador to the western Aleutian Islands, Alaska in the north. The bald eagle inhabits estuaries, large lakes, reservoirs, major rivers, and some seacoast habitats. They usually nest in trees near water but are known to nest on cliffs.

In 1782, there were as many as 100,000 nesting bald eagles living in the continental U.S. (USFWS 2001a). Over the years due to pesticide contamination and hunting the bald eagle population dramatically decreased and by 1963 there were approximately 417 pairs. Due to recovery efforts, this number has risen and in 1998 the population increased to 5,748 nesting pairs (USFWS 2001a). Furthermore, the Pacific Region delisting goal of 800 nesting pairs has been achieved since 1995 and the numbers of pairs has continued to increase (USFWS 1999a). In California, the number of pairs has increased from 43 in 1992 to 143 in 1998 (USFWS 2001a).

The bald eagle is a rare raptor on Camp Pendleton. The nearest occupied breeding areas occur off Base, near Whelan Lake and within the Windmill Lake vicinity in Oceanside (Peter

Bloom, pers. comm. 2001). However the bald eagles use San Mateo and San Onofre drainages for foraging habitat during migration.

Threats. – The decline in population is attributed to loss of nesting habitat, due to development along the coast and near inland rivers and waterways, forest clearing and environmental contaminants (e.g., from dichlorodiphenyltrichloroethane [DDT] use in the 1940s, 1950s, and 1960s).

3.2.3.2 BROWN PELICAN

Status. – The USFWS listed the brown pelican (*Pelecanus occidentalis*) as federally endangered on 2 June 1970 (USFWS 1970a,b). No critical habitat has been designated for the brown pelican; however, a recovery plan has been approved (USFWS 1983).

Distribution and Occurrence. – Brown pelicans range from the Pacific, Atlantic, and Gulf coasts north to Nova Scotia. They nest on offshore islands from Maryland down to Venezuela, from California south to Chile. In the sixties and seventies, brown pelican populations decreased dramatically due to the consumption of fish that contained DDT and other hard pesticides. Populations recovered somewhat after DDT became unavailable, although, the range of this species has been slightly reduced. The southern California population is estimated at 4,500 to 5,000 breeding pairs. Although the brown pelican does not use the Base as a breeding ground, it feeds in shallow estuary waters and uses sand spits and offshore sandbars for daily loafing and as nocturnal roost areas.

Threats. – Brown pelicans and their habitat are threatened by erosion, plant succession, hurricanes, storms, tick infestations, eating contaminated fish caused by pesticides, sewage spills and oil spills, and unpredictable food supplies.

3.2.3.3 CALIFORNIA LEAST TERN

Status. – The California least tern (*Sterna antillarum browni*) was federally listed as an endangered species by the USFWS in 1970 (USFWS 1970a,b). No critical habitat has been designated for this species and the recovery plan has been revised several times (USFWS 1980, 1985a). An additional revision is expected by 2002.

Distribution and Occurrence. – The California least tern is a migratory bird that historically nested in large beach colonies along the coastline from southern Baja, Mexico to central coastal California. Over the years the California least tern nesting habitat has been drastically reduced as a result of regional urbanization. Nesting is currently limited to San Francisco Bay and areas along the coast from San Luis Obispo County to San Diego County. Largest concentrations of breeding pairs nest in Los Angeles, Orange, and San Diego Counties. Migration routes and wintering range for the California least tern are not well known; it is thought that this species winters along the Pacific Coast of Central America.

California least tern populations have declined since the early 1900s. At least 1,000 nesting

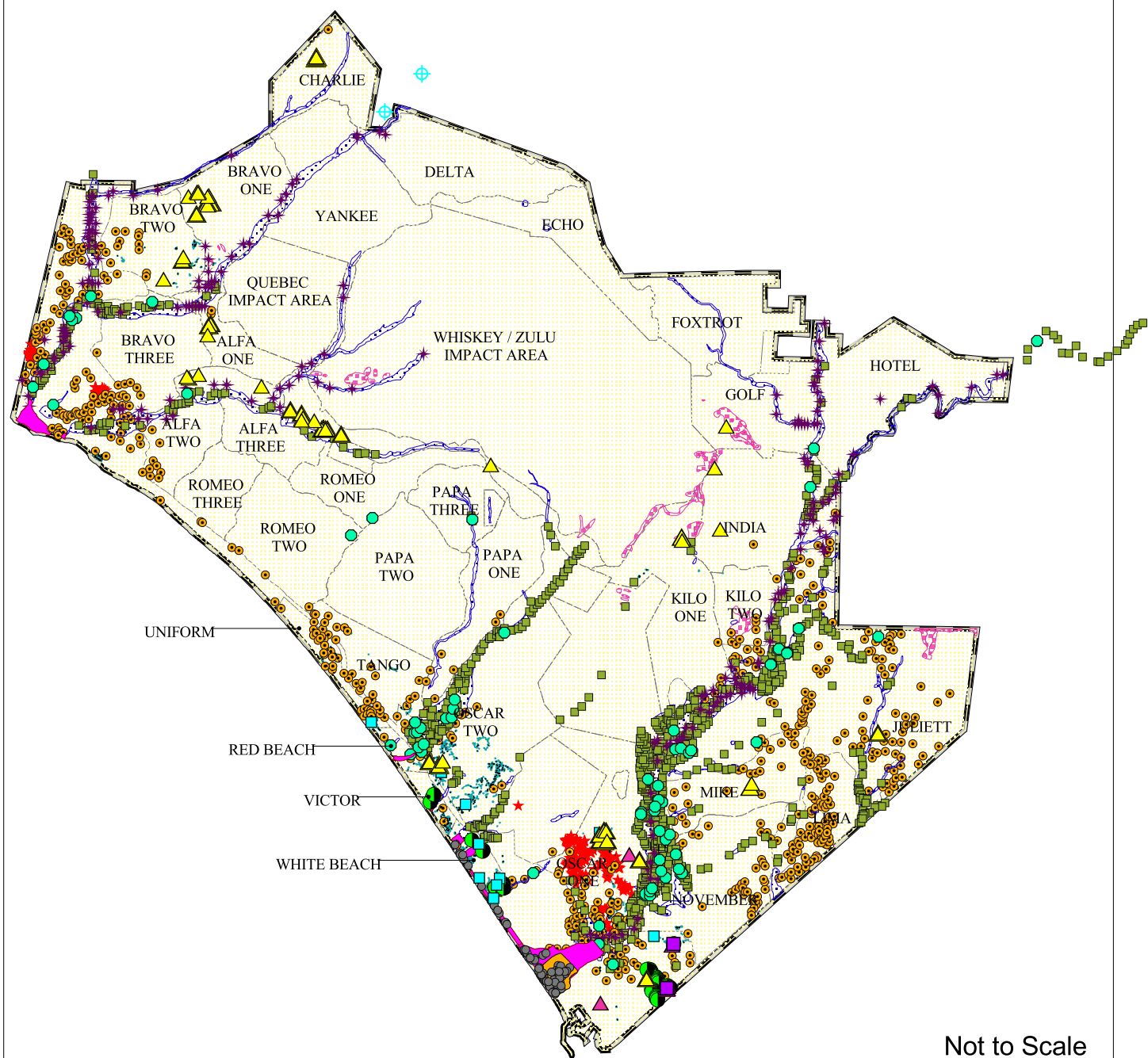


Figure 3-5
Threatened and Endangered Species

- Camp Pendleton Boundary**
- Training Area Boundary
 - Major Streams and Drainages
 - Vernal Pool Groups
 - San Diego Fairy Shrimp
 - Riverside Fairy Shrimp
 - California Least Tern
 - Tidewater Goby
 - Stephen's Kangaroo Rat
 - San Diego Button Celery
 - Spreading Navarretia
 - San Diego Button Celery & Spreading Navarretia
 - Thread-leaf Brodiaea
 - Pacific Pocket Mouse
 - Arroyo Toad
 - Least Bell's Vireo
 - Western Snowy Plover
 - Southwestern Willow Flycatcher
 - Coastal California Gnatcatcher
 - Southern Steelhead Trout



Map Source:
AC/S Environmental Security
GIS Branch
October 2001



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pairs of least terns were reportedly observed along a three-mile section of coastline in San Diego County from Pacific Beach to Mission Bay in the early 1900s (Foster 2001). By 1969, the statewide tern population was down to 182 pairs (Patton 2000). During the year of the listing, 1973, the statewide tern population totaled 600 pairs (Massey 1989; Caffrey 1993). Since then, intensive management practices have resulted in an increase in the tern population and by 1992 the statewide tern population was up to 2,106 nesting pairs (Massey 1989; Caffrey 1993).

Since 1969, the California least tern has spent the breeding phase of its life cycle on Camp Pendleton, typically arriving in mid-April and departing by September (Foster 2001). This small migratory tern nests colonially on undisturbed, sparsely vegetated, flat areas with loose, sandy, or salt pan substrate. On Camp Pendleton, California least tern nesting sites are located on the beaches at the mouths of the Santa Margarita River (Blue Beach), North Beach, French, and Aliso Creeks (White Beach). Nesting also occurs on the salt flats of the Santa Margarita Estuary. Figure 3-5 illustrates the general distribution of the California least tern on Base. Least terns are opportunistic feeders known to capture more than 50 species of fish in relatively shallow, nearshore waters and coastal freshwater ponds, channels, and lakes.

The Base follows active management practices for protecting the least tern breeding habitat. Beginning in 1988, the Base retained protective fencing around the Santa Margarita River nesting site throughout the year. Additionally, during the breeding season a fence is put up along all known breeding locations to protect the colonies from military training on the beach. Intensive predator control and monitoring programs are also practiced. As a result of these efforts, the Base has shown an increase in the nesting population. In 1992, 43% of the nesting population of California least terns was located on Department of Defense lands, including 18% on Camp Pendleton (Caffrey 1993). In 1999, the number of nesting pairs in San Diego County was up to 2,333, with 672 (29%) found on Camp Pendleton (Keane 1999). Additionally, results of the 2000 California statewide surveys show that 23% of the 4,522 nesting pairs are located on Camp Pendleton (Patton 2000).

Threats. – The decline in California least tern populations is largely attributable to loss of nesting and foraging habitat (e.g., from construction of Pacific Coast Highway, beach homes, etc.) and disturbance to breeding colonies, including dredging, filling, water pollution, development along shorelines, and domestic and wild animals (USFWS 1970, 1980).

3.2.3.4 COASTAL CALIFORNIA GNATCATCHER

Status. – The USFWS designated the coastal California gnatcatcher (*Poliophtila californica californica*) as threatened on 30 March 1993 (USFWS 1993a). At the time the gnatcatcher was given federal protection as a threatened species, the U.S. Secretary of Interior issued a Special Rule designed to empower a habitat-oriented conservation planning law enacted by the State of California, the Natural Community Conservation Planning process (USFWS 1993a). The objectives of the NCCP program involve working with local governments and landowners to identify and protect habitat in sufficient amounts and distribution that will enable long term conservation of the coastal sage scrub community as well as other sensitive habitat types (CDFG 1992). The USFWS recently designated critical habitat for the coastal

California gnatcatcher in the southern California ecoregion, including on federal lands (USFWS 2000b). The USFWS concluded that the benefits of excluding Camp Pendleton exceed the benefits of including the Base in the critical habitat designation under Section 4(b)(2) to ensure that mission-critical military training activities can continue without interruption at Camp Pendleton. Currently, there is no recovery plan for the California gnatcatcher.

Distribution and Occurrence. – The coastal California gnatcatcher is a non-migratory bird with a range restricted to California and Baja California, Mexico. This subspecies is found from Ventura County south to San Diego County and east to San Bernardino County. On Camp Pendleton, the coastal California gnatcatcher's distribution is markedly clumped, with concentrations in the northern (State Park), coastal, and southern (inland) portions of the Base (Figure 3-5). The gnatcatcher occurs almost exclusively in the coastal sage community, but can also be found in chaparral and riparian habitats. The breeding season of the gnatcatcher extends from late February through July, with peak nesting activities occurring from mid-March through May.

Over the years intensive survey efforts on Base have resulted in an increase in known gnatcatcher populations. Surveys in 1989 found 179 gnatcatcher pairs on Camp Pendleton and in 1994 the population increased to 224 total sightings (note: total sightings includes pairs, individuals, and juveniles) (Griffith Wildlife Biology 1997a). A basewide survey (excluding the State Park lease areas) in 1994 found 554 coastal California gnatcatcher locations composed of 388 verified pairs, 47 single males, 14 single females, 30 birds of unknown sex (many were probably paired), and 75 juveniles not associated with family groups (Griffith Wildlife Biology 1997a). Foothill Transportation Corridor surveys conducted in 1995 and primarily in the State Park lease areas found 95 coastal California gnatcatchers. There was some overlap in the areas surveyed in 1994 and 1995. A 1998 basewide survey (including the State Park lease area) found 620 pairs of coastal California gnatcatcher (Atwood et al. 1999). Surveys were conducted in suitable scrub habitat within the defined study area of each effort. By placing a 500-ft-radius buffer around each 1998 coastal California gnatcatcher GIS point, and removing overlapping buffers and off-Base areas, approximately 8,260 acres are estimated to be occupied by coastal California gnatcatcher on Base. The distribution of coastal California gnatcatchers across the Base (excluding the State Park lease area) during 1994 and 1998 was similar. The 1998 population of gnatcatchers on Camp Pendleton accounts for 18% of the San Diego County population.

Threats. – Although numerous factors were involved in the decline of the coastal California gnatcatcher, habitat destruction and fragmentation are the principal reasons for the species' current threatened status. Agricultural use, urbanization, increased fire frequency, nest parasitism by cowbirds, and introduced exotics have adversely impacted extant sage scrub habitat.

3.2.3.5 LEAST BELL'S VIREO

Status. – The USFWS listed the least Bell's vireo (*Vireo bellii pusillus*) as an endangered species on 2 May 1986 (USFWS 1986b). Critical habitat for the least bell's vireo was

designated in 6 southern California counties on 2 February 1994 (USFWS 1994a). Camp Pendleton was excluded from this designation due to a MOU with the USFWS. A draft recovery plan is available for this species (USFWS 1998a).

Distribution and Occurrence. – Formerly common and widespread in California and northwestern Baja California, the least Bell's vireo was reduced to about 300 pairs in the mid-1980s. The vireo's dramatic decline is due to widespread loss of low elevation riparian habitat combined with range expansion by the brown-headed cowbird (*Molothrus ater*), a serious brood parasite of open-cup nesting songbirds. After active management measures (namely cowbird control and habitat conservation) were instituted in the early 1980s, the vireo population increased to an estimated 600 pairs in 1991 (Pavelka 1994).

The least Bell's vireo arrives at Camp Pendleton from mid-March to early April and leaves for its wintering ground in southern Baja California in August (Franzreb 1989). Vireos primarily inhabit dense willow-dominated riparian habitats with lush understory vegetation. They nest 3-4 feet above the ground in dense understory and use taller trees for foraging and singing perches (Salata 1981). Least Bell's vireos forage primarily in willows. However, vireos nesting on the edge of riparian habitat or in riparian corridors less than 150 feet wide have been observed foraging up to 180 feet away from the willow-riparian edge in coastal sage scrub and chaparral (Kus & Miner 1989). Home ranges of vireos in the Santa Margarita River habitat varied from less than ½ acre to over 9 acres (mean 2.64 acres) in 1988; a majority were between 1 and 2 ½ acres (Jones 1989). A summary of breeding and territorial male least Bell's vireos observed on Camp Pendleton between 1979 and 2000 is shown in Table 3-5. Figure 3-5 illustrates the general distribution of the least Bell's vireo on Base.

Active management for the least Bell's vireo on Camp Pendleton began in 1981. A cowbird live-trapping and removal program was first initiated in 1983 with 5 traps on the Santa Margarita River. The cowbird control program expanded to 33 traps basewide by 1994 and to 40 traps basewide in 2000. Since cowbird control began, the number of vireo locations at Camp Pendleton has increased from 62 to nearly 1000 (Griffith Wildlife Biology 2000). Additionally, the incidence of nest parasitism dropped from 47% in 1982 to 3.3% in 1986 (Beezley & Rieger 1986). As the trap design was improved and the number of traps increased, the incidence of cowbird nest parasitism continued to decline and reached 0.5% in 1990. Currently, the parasitism by cowbirds continues to diminish, but there are still high numbers of cowbirds being captured, indicating that little impact upon the regional cowbird population is being made over time. Populations of other species impacted by cowbirds, including the California gnatcatcher, Swainson's thrush (*Catharus ustulatus*), Hutton's vireo (*Vireo huttoni*), warbling vireo (*vireo gilvus*), Wilson's warbler (*Wilsonia pusilla*), yellow warbler (*Dendroica petechia*), yellow-breasted chat (*Icteria virens*), blue grosbeak (*Guiraca caerulea*), and lazuli bunting (*Passerina amoena*), have also increased on Camp Pendleton (Griffith Wildlife Biology 1994).

Under the Riparian BO (USFWS 1995a), Camp Pendleton maintains a minimum of 1,200 acres of riparian habitat to support the least Bell's vireo and other riparian species. Vegetation categories used by least Bell's vireo are riparian woodland, riparian scrub, and mixed woodland.

TABLE 3-5. Number of singing male least Bell's vireos ^a on different drainages at Camp Pendleton, 1978 to 2000 (data sources: Salata 1983; Pavelka 1994; Kus 1996; Griffith Wildlife Biology 1992, 1997b, 1998, 1999a, 2000). (Table modified from Griffith Wildlife Biology 1999b.)

Year ^b	Field Hrs. ^c	DRAINAGE ^d														Total	% Growth ^e
		S M R	C C	S M C	S O C	P D L	L F C	A C	F C	D L C	F B C	P B C	W C	P C	M I S		
1978		5		0			0									5	
1980	100	14		1	0		0			0				0		15	200
1981	300	26		0	0		1			0						27	80
1982	750	43		0	0		2			0						45	67
1983	615	60		0	0		1			1						62	38
1984	526	83		0	0		0			0						83	34
1985	511	86					0			1						87	5
1986	539	98		0	0		0			2						100	15
1987	760	142		3	0		4		0	3				4		156	56
1988	1375	200		1	0		3		0	2	0			4		210	34
1989	1184	154		0	0		5		0	2	0			11		172	-18 ^f
1990	964	189		1	0		8	0	0	0	0			11		209	22
1991	960	212		1	1		22	2	1	3	0			14		256	25
1993	307	319		4	3	1	59	5	1	3	6	1	1	20		423	65
1995	1243	426	2	23	15	1	125	12	7	24	11	1		44	5	696	65
1996	1120	523	5	48	27	1	148	24	10	26	16	2	2	48	22	902	30
1997	1260	540	4	51	30	1	164	19	9	24	2	3	1	61	26	935	3
1998	1546	567	3	55	40	9	157	22	6	15	15	6	5	68	43	1011	8
1999	1582	486	11	63	44	8	126	18	6	18	18	3	8	42	34	885	-12
2000	1602	440	9	56	40	3	112	23	7	22	14	3	7	35	36	807	-8

^a Singing males include resident males (present > 30 days, paired, or single) and transient males (present <30 days). Transient males not included for total in 1981-1986, 1995.

^b Comprehensive surveys were not performed in 1979, 1992, and 1994.

^c Cursory walk by surveys in 1978 and 1980.

^d Drainages: Santa Margarita River (SMR), Christianitos Creek (CC), San Mateo Creek (SMC), San Onofre Creek (SOC), Piedre de Lumbré (PDL), Las Flores Creek (LFC), Aliso Creek (AC), French Creek (FC), De Luz Creek (DLC), Fallbrook Creek (FBC), Pueblitos Canyon (PBC), Windmill Canyon (WC), Pilgrim Creek (PC), Miscellaneous (MIS). Blank cells represent no survey performed.

^e Percent growth = (Current Year – Past Year/Past Year) x 100. Note 1980, 1993, and 1995 is over 2 years.

^f The decrease in vireo numbers from 1988 –1989 and from 1998-1999 occurred throughout the subspecies range due to unknown causes.

Threats. – The decline in least Bell's vireos is attributed to permanent or long term loss and degradation of nesting habitat and riparian woodlands due to urban development, human disturbance, and nest parasitism by cowbirds (USFWS 1986b).

3.2.3.6 LIGHT-FOOTED CLAPPER RAIL

Status. – The light-footed clapper rail (*Rallus longirostris levipes*) was federally listed as an endangered species by the USFWS on 13 October 1970 (USFWS 1970b). No critical habitat has been designated for this species; however, a recovery plan is available (USFWS 1985b).

Distribution and Occurrence. – The light-footed clapper rail is a nonmigratory bird found in coastal fresh and salt water marshes in southern California and northern Baja, California, Mexico. Currently, the light-footed clapper rail is found in only a fraction of the marshes it once occupied. The rail has been absent from Los Angeles County since the early 1980s and populations in Santa Barbara County are also thinning. The largest number light-footed clapper rails, about 60% of the state breeding population, reside in Upper Newport Bay Ecological Reserve in Orange County (Zembal & Hoffman 2000).

The population and distribution of the clapper rail in California has varied over the years. In 1980, 203 pairs of light-footed clapper rails were observed in 11 different marshes; in 1996, 325 pairs were observed in 15 marshes; and, in 2000, 253 pairs were observed in 16 marshes (Zembal & Hoffman 2000). Some populations in California have been successfully augmented through the translocation of eggs (Zembal & Hoffman 2000).

On Camp Pendleton, Dr. Richard Zembel (formerly of the USFWS) has conducted independent surveys of the light-footed clapper rail annually from 1980 through 2000. The survey areas include San Mateo Creek Mouth, Las Flores Marsh, Cocklebur Canyon Mouth, and Santa Margarita Lagoon (note: not all locations were surveyed every year) (Zembal & Hoffman 2000). During these survey efforts, clapper rails were detected in the Santa Margarita River mouth (1982-1988), Cocklebur Canyon mouth (1982), and Las Flores Marsh (1983) (Zembal et al. 1984). Total sightings on Base were never greater than three pairs for a single survey season from 1982 to 1988. The reports from Cocklebur Canyon and Las Flores marsh are probably from transient birds (Zembal et al. 1984). In 1993 and 1997 unpaired rails were seen in the Santa Margarita Lagoon (Zembal & Hoffman 2000).

The light-footed clapper rail feeds mostly on clams, spiders, mussels, and crabs. Preferred marsh vegetation varies from salt marshes heavily dominated by pickleweed (*Salicornia virginica*) to freshwater marshes with dominant cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.) with occasional intermixed willows (*Salix* spp.) (Zembal & Massey 1986). In addition, scattered stands of spiny rush (*Juncus acutus* ssp. *leopoldii*) are critical for rail nest placement (Zembal & Hoffman 2000).

Threats. – The decline in light-footed clapper rails is attributed to urban development, human disturbance, predation, and a general loss or degradation of feeding and nesting habitat in coastal salt marshes and estuaries (USFWS 1970b).

3.2.3.7 PEREGRINE FALCON

Status. – The peregrine falcon (*Falco peregrinus anatum*) was listed as an endangered species on 2 June 1970 (USFWS 1970a,b). On 22 September 1977 critical habitat was designated for the peregrine falcon. Because of active management and recovery efforts, the peregrine falcon was delisted and designated critical habitat was removed on 25 August 1999 (USFWS 1999b). The peregrine falcon remains on the California list of threatened and endangered species as endangered and retains protection under the Migratory Bird Treaty Act.

Distribution and Occurrence. – In North America, peregrine falcons could be found in mountains and valleys as well as along the coastline from the Arctic tundra down to Mexico. By the mid 1960's there were no peregrine falcons in the eastern United States. The decline spread westward and by the 1970s, western populations had declined by 90 percent. The peregrine falcon disappeared as a breeding species from southern California, and in many other parts of the western United States, southern Canada, and Northwest Territories. This drastic decline was caused by the consumption of DDT (USFWS 1999b). Beginning in 1974, various state provinces and national agencies in both Canada and the United States put forth great efforts for the recovery of the peregrine falcon. Since 1977, over 2700 peregrine falcons were released in the western United States (Tarski 2001). In 1998, the total known breeding population of peregrine falcons was 1,650 pairs in the United States and Canada (USFWS 1999b).

Peregrine falcons can be seen on Camp Pendleton at anytime of the year. In recent years, one of the five known historic nesting sites on Base has been occupied (P. Bloom, pers. comm. 2001). In addition, the peregrine falcon uses the mouth of the Santa Margarita River, San Mateo, and San Onofre Creeks to forage.

Threats. – The decline in the peregrine falcon population is attributed to environmental contaminants, primarily DDT and metal contaminants, and degradation of nesting and foraging habitats.

3.2.3.8 SOUTHWESTERN WILLOW FLYCATCHER

Status. – The southwestern willow flycatcher (*Empidonax traillii extimus*) was federally listed as an endangered species by the USFWS on 27 February 1995 (USFWS 1995c). On 22 July 1997 the USFWS designated critical habitat for this species (USFWS 1997a). A draft recovery plan has been published for comments (USFWS 2001b).

Distribution and Occurrence. – The southwestern willow flycatcher is a neotropical migrant. It arrives in breeding habitat as early as mid-May and may be present until mid-August. The breeding range of this flycatcher extends from southern California, east to western Texas, north to extreme southern Utah and Nevada, and south to extreme northern Baja California del Norte and Sonora (Unitt 1987). Migration routes and wintering range for the southwestern willow flycatcher are not well known; it is thought that this species winters in Mexico, Central America, and perhaps northern South America.

In the last 50 years the southwestern willow flycatcher has declined precipitously. Since 1992, more than 800 historic and new locations have been surveyed range wide to document the status of the species. In 1997, the estimated known population of the southwestern willow flycatcher was estimated between 300 and 500 pairs (USFWS 1997a).

TABLE 3-6. The distribution and abundance of singing (territorial) male southwestern willow flycatchers observed on different drainages at Camp Pendleton, 1981 to 1999 (data sources: Griffith Wildlife Biology 1997b, 1998, 1999a, 1999c; Kus 2001).^a

		DRAINAGE ^b															
Year	Field Hrs.	S				S	S	P	L			D	F				Total
		M	N	H	C	M	O	D	F	A	F	L	B	R	W	P	
		R	C	C	C	C	C	L	C	C	C	C	C	C	C	C	
1981	na	5		ns			na					na				na	5
1982	na	10		ns			na					na				na	10
1983	na	10		ns			na					na				na	10
1984	na	16		ns			na					na				na	16
1985	na	15		ns			na					na				ns	15
1986	na	17		ns	ns	na	na	ns	na	ns	ns	ns	ns	ns	ns	2	19
1987	na	na		ns	ns	0	0	ns	0	ns	ns	na	ns	ns	ns	3	3
1988	1375	23		ns	ns	na	na	ns	na	ns	na	na	0	ns	ns	2	25
1989	1184	16		ns	0	0	0	0	0	0	0	0	0	0	0	2	18
1990	964	19		ns	0	0	0	0	1	0	0	0	0	0	0	3	23
1991	960	19		ns	0	0	0	0	1	0	1	3	0	0	0	2	26
1992	535	3		ns	0	0	0	1	0	0	0	3	0	0	0	0	7
1993	307	6		ns	0	0	0	0	1	0	0	0	0	0	0	2	9
1994	345	9		ns	0	0	7	0	3	0	0	0	0	0	0	4	23
1995	1120	10		1	0	2	1	0	3	0	0	1	1	0	0	6	25
1996		12		1	3	0	0		5							2	23
1997		16	3	1	ns	1	0		5							2	28
1998	1546	20	0	1		0	0		1				5			0	27
1999	1208	18														0	18
2000		18															18

^a (na) survey performed but no data available, (ns) no survey performed.

^b **Drainages:** Santa Margarita River (SMR), Newton Canyon (NC), Hidden Canyon (HC), Christianitos Creek (CC), San Mateo Creek (SMC), San Onofre Creek (SOC), Piedre de Lumbre (PDL), Las Flores Creek (LFC), Aliso Creek (AC), French Creek (FC), De Luz Creek (DLC), Fallbrook Creek (FBC), Roblar Creek (RC), Windmill Canyon (WC), Pilgrim Creek (PC).

The southwestern willow flycatcher's population on Camp Pendleton has varied considerably over the years. The number of singing males recorded on Camp Pendleton has ranged from 5 in 1981, increasing to 18, 23, and 26 (in 1989, 1990, and 1991, respectively), returning to a low of 7 in 1992 (Griffith Wildlife Biology 1998). Singing males have also ranged in choosing territories over the years. For example, on San Onofre Creek 7 males were found in 1994, one male was found in 1995, and no males have been found there since. The Santa Margarita River is the only drainage where males have consistently occurred over the years. Recently, in 1999 and 2000, the southwestern willow flycatcher was only found along the Santa Margarita River. A summary of distribution and abundance of singing (territorial) male southwestern willow flycatchers observed on Camp Pendleton between 1981 and 2000 is shown in Table 3-6. Figure 3-5 illustrates the general distribution of the southwestern willow flycatcher on Camp Pendleton.

The southwestern willow flycatcher inhabits riparian areas along rivers, streams, and other wetlands. It nests in typically even-aged, structurally homogeneous, dense stands of trees and shrubs approximately 13-23 feet tall with a high percentage of canopy cover and dense foliage from 0-13 feet above the ground (Brown 1988; Sedgewick & Knopf 1992). Nesting willow flycatchers in San Diego County prefer willow (*Salix* spp.), and mulefat (*Baccharis* spp.) thickets (Unitt 1987) and invariably nest near surface water or saturated soil (Phillips et al. 1964).

Threats. – The factors contributing to the decline of the southwestern willow flycatcher populations are attributed to human disturbance, nest parasitism by cowbirds, and permanent or long term loss and degradation of nesting habitat and riparian woodlands. Habitat loss and degradation are due to urban, recreational, and agricultural development; diminished water quality; fires; water projects; livestock grazing; and changes in the riparian plant community caused by exotic plant species.

On Camp Pendleton southwestern willow flycatchers have not responded as dramatically to cowbird control as have least Bell's vireos, suggesting that factors other than brood parasitism are preventing their recovery (Griffith Wildlife Biology 1999c). The decline of southwestern willow flycatcher population on Camp Pendleton is thought to be caused by the degradation of older, more complex willow riparian habitat, limited water flow during critical periods when adults are raising young, and the destructive effects of exceptionally high flows during winter and spring (leading to colonization of potentially high-quality habitat by invasive exotic species).

3.2.3.9 WESTERN SNOWY PLOVER

Status. – The western snowy plover (*Charadrius alexandrinus nivosus*) was listed by the USFWS as threatened on 5 March 1993 (USFWS 1993b). Critical habitat has been designated for this species, but not on Camp Pendleton due to the presence of an adequate management plan. A draft recovery plan for the western snowy plover is available (USFWS 2001c).

Distribution and Occurrence. – The western snowy plover breeds on the Pacific coast from

southern Washington to southern Baja California, Mexico, and in interior areas of Oregon, California, Nevada, Utah, New Mexico, Colorado, Kansas, Oklahoma, and north-central Texas, as well as coastal areas of Texas and possibly northeastern Mexico. The Pacific coast population of the western snowy plover is genetically isolated from western snowy plovers breeding in the interior (USFWS 1993b). The Pacific coast population of the western snowy plover is defined as those individuals that nest adjacent to or near tidal waters, and includes all nesting colonies on the mainland coast, peninsulas, offshore islands, adjacent bays, and estuaries (USFWS 1993b). The coastal population of the western snowy plover consists of both resident and migratory birds; some birds winter in the same areas used for breeding (USFWS 1993b). Migratory individuals of the coastal western snowy plover travel either north or south within their coastal range.

Since 1994, the Base has been performing yearly surveys for the western snowy plover (Pacific coast population) shown in Table 3-7. Nesting sites include: French Creek (White Beach), Cocklebur Beach, North Beach (South), South Beach, Blue Beach, and the Santa Margarita salt flats (Collier & Terp 2000). The Santa Margarita estuary on Camp Pendleton supports approximately 50 breeding pairs of western snowy plovers, nearly equivalent to the number of breeding pairs in the rest of San Diego County. In 1998, 42% of all the snowy plovers in San Diego County were breeding on Camp Pendleton (Collier & Terp 2000). Figure 3-5 illustrates the general distribution of the western snowy plover on Base.

TABLE 3-7. Western snowy plover nest monitoring data from 1994 to 2000.^a (Data provided by USGS/USFWS nest monitors [Collier & Powell 2000]).

	1994	1995	1996	1997	1998	1999	2000 ^b
# Nests Found	46	111	112	106	82	50	48
Estimated # Males	40.25	78.90	66.54	55.45	49.02	42.00	37.62
Estimated # Females	35.78	55.65	53.54	42.12	43.94	34.13	39.11
Total Estimated # Individuals	76.03	134.54	120.08	97.57	92.96	76.13	76.73

^a Number of breeding males and females based on actual number of known nests.

^b Jill Terp (USFWS), pers. comm. 2001.

Plovers feed primarily on insects and other invertebrates that they find in the wet sand along the surf and in the lagoons. The plover lays its eggs in a shallow depression in the salt pan or salt flat area of an estuary or in beach dune areas near estuaries. It lays two to four eggs per nest, with two or three clutches in one year.

Threats. – The decline in the western snowy plover population is attributed to human disturbance, predation, and loss of nesting habitat to encroachment of introduced European beachgrass (*Ammophila arenaria*) and urban development (USFWS 1993b).

3.2.3.10 PACIFIC POCKET MOUSE

Status. – The USFWS emergency listed the Pacific pocket mouse (*Perognathus longimembris pacificus*) as endangered on 3 February 1994 (USFWS 1994b) and published the final listing on 29 September 1994 (USFWS 1994c). No critical habitat has been designated for this species; however, a recovery plan has been approved (USFWS 1998b).

Distribution and Occurrence. – Historically, Pacific pocket mice occurred within about 3 km of the immediate coast of southern California from Marina Del Rey and El Segundo in Los Angeles County south to the vicinity of the Mexican border in San Diego County. Within its range, the Pacific pocket mouse has a much localized distribution on suitable habitat. Currently, its only known localities include one population at Dana Point, California and three populations on Base (Figure 3-5): the Oscar One and Edson Range training areas, east of the San Onofre housing area (San Mateo South), and in the northeast corner of the Base between the Base boundary with San Clemente and Cristianitos Road (San Mateo North).

During a 10-day trapping period in 1996 (equivalent to 4,800 trap nights given the number of traps and survey effort), 112 Pacific pocket mice (unique individuals, not counting recaptures) in the Oscar One training area were captured (USFWS 1999c). In a separate survey effort that same season, the distribution of captures expanded the known range of the Pacific pocket mouse in the Oscar One training area from 6 to 385 hectares (USFWS 1999d). More recent presence/absence surveys documented Pacific pocket mice on the adjacent Edson Range training area (SJM Biological Consultants 1998). A survey in 1996 at the San Mateo South site produced 19 unique Pacific pocket mice after 5,975 trap nights (Ogden 1997). A 1996 survey tallied a minimum of 22 Pacific pocket mice at the San Mateo North site after a few thousand-trap nights (Brandman 1997). There is some discussion over San Mateo South and San Mateo North representing one or two separate populations; the sites are about one mile apart and are separated by an agriculture field, San Mateo Creek, and a paved, public access road. Camp Pendleton considers them as separate populations. By placing a 500-ft-radius buffer around all known Pacific pocket mouse GIS points, and removing overlapping buffers and off-Base areas, approximately 945 acres are estimated to be occupied by the Pacific pocket mouse on Base.

Threats. – Urban development and agriculture are threats to the survival of the Pacific pocket mouse. Urban development can destroy pocket mouse habitat and kill individuals. Construction projects can fragment habitat and isolate pocket mouse populations, thereby making them susceptible to catastrophic events such as fire. In addition, urban developments impact rodent populations indirectly by introducing and harboring domestic cats.

3.2.3.11 STEPHENS' KANGAROO RAT

Status. – The USFWS designated the Stephens' kangaroo rat (*Dipodomys stephensi*) as federally endangered on 30 September 1988 (USFWS 1988). Critical habitat has not been designated for this species, nor has a final recovery plan been approved. A draft recovery

plan is, however, available (USFWS 1997b).

Distribution and Occurrence. – The Stephens' kangaroo rat has a regional distribution extending along the San Jacinto Valley of San Diego, Riverside, and San Bernardino counties. Numerous small, fragmented populations scattered across a range of approximately 1,100 square miles characterize this distribution. A comprehensive, rangewide total of occupied habitat is not available. Surveys conducted on Camp Pendleton during 1994 to 1996 indicated approximately 800 acres of occupied Stephens' kangaroo rat habitat (Montgomery et al. 1996, 1997). However, subsequent field studies indicated that the area of occupied Stephens' kangaroo rat habitat on the Base has decreased to approximately 684 acres (15% reduction), due to the apparent extirpation of this species at Range 313A, the 210 Series Ranges, and Range 116 (Tetra Tech, Inc. 1999). The Stephens' kangaroo rat requires sparse coastal sage scrub and grassland. Moderate human disturbances (e.g., certain grazing regimes, brush removal, mowing, and fires) can benefit Stephens' kangaroo rat habitat by maintaining sparse shrub growth. When these factors are removed, the habitat on site may change to more dense coastal sage scrub or introduced European grassland conditions that are not favorable to the Stephens' kangaroo rat. The USFWS states that the Stephens' kangaroo rat is frequently found in close association with dirt roads, previously and currently disturbed areas, and/or other sites with a high percentage of bare ground (USFWS 1997b). Figure 3-5 illustrates the general distribution of the Stephens' kangaroo rat on Camp Pendleton.

Threats. – Agriculture and urban development have greatly reduced and fragmented the amount of habitat available for Stephens' kangaroo rat. As a result, the Stephens' kangaroo rat is more susceptible to the effects of grazing, off-road vehicle activity, rodenticide use, decreased genetic diversity, and domestic cat predation.

3.2.3.12 SOUTHERN STEELHEAD TROUT

Status. – The southern California evolutionarily significant unit of the southern steelhead trout (*Oncorhynchus mykiss*) was federally listed as an endangered species by the National Marine Fisheries Service (NMFS) on 18 August 1997 (NMFS 1997) and by the USFWS on 17 June 1998 (USFWS 1998c). The southern limit of this federal listing extended to Malibu Creek in Los Angeles County, north of Camp Pendleton. Critical habitat was designated for this evolutionarily significant unit of steelhead on 16 February 2000 (NMFS 2000a). On 19 December 2000 (NMFS 2000b) the NMFS issued a proposed rule to extend the current range of the southern California steelhead to include the population of steelhead recently found in San Mateo Creek located in northern San Diego County. To assist in the determination of a ruling, the California Department of Fish and Game prepared a report for NMFS (CDFG 2000b) on the steelhead in San Mateo Creek and the public comment period had been extended. At the time of publication of this document, the proposed rule for range extension had not been finalized. A steelhead restoration and management plan for California is available by the Department of Fish and Game (McEwan & Jackson 1996).

Distribution and Occurrence. – Historically, the steelhead ranged throughout the eastern Pacific Ocean from the Kuskokwim River in Alaska to the Rio del Presidio in Baja

California. Southern steelhead (those occurring south of San Francisco Bay) were formerly found in coastal drainages as far south as the Santo Domingo River in northern Baja California and were present in streams and rivers of Los Angeles, Orange, and San Diego counties (McEwan & Jackson 1996). In 1946, Hubbs reported steelhead making runs in San Mateo, San Onofre, and San Juan creeks and in the San Diego, San Luis Rey, and Tijuana rivers of Orange and San Diego counties (McEwan & Jackson 1996). Steelhead had thought to be extirpated from much of its historic range in southern California; the San Mateo Creek population had previously been classified by some researchers as extinct (Nehlsen et al. 1991). In 1999, the first reoccurrence of a juvenile steelhead was observed in San Mateo creek (CDFG 2000b). Between 3 March and 3 September 1999, 78 steelhead/rainbow trout observations were made (CDFG 2000b). In 2000, the numbers of steelhead observed declined from 3 adults and 17 juveniles observed in June to only one juvenile seen in November (Hovey 2000a-f). Figure 3-5 illustrates the general locations of steelhead observances in the San Mateo Creek.

Threats. – The major factor affecting the southern steelhead populations are from urbanization and other watershed disturbances, blocked access to headwater spawning and rearing areas, and partial and total dewatering of streams by water diversions and groundwater pumping (McEwan & Jackson 1996). Additionally, increased soil erosion, loss of riparian vegetation, water pollution, and introduced predators and competitors are affecting the steelhead population.

3.2.3.13 TIDEWATER GOBY

Status. – The tidewater goby (*Eucyclogobius newberryi*) was federally listed as an endangered species by the USFWS on 4 February 1994 (USFWS 1994d). On 24 June 1999, the USFWS proposed to delist the northern populations of the tidewater goby and to retain the endangered status in Orange and San Diego Counties. This proposal is based on the conclusion that the southern California populations are genetically distinct and represent a distinct population segment (USFWS 1999e). On 20 November 2000, the USFWS designated 10 coastal stream segments, totaling approximately 9 linear miles of rivers, streams, and estuaries in Orange and San Diego Counties as critical habitat for the tidewater goby (USFWS 2000a). A draft recovery plan for the tidewater goby is available (USFWS 1996).

Distribution and Occurrence. – Tidewater gobies are a California endemic species and are unique in that they are restricted to coastal brackish water habitats (USFWS 2000a). At the time of listing, it was believed that this species historically occurred in at least 87 of California's coastal lagoons, ranging from Agua Hedionda Lagoon (northern San Diego County) to Tillas Slough (mouth of the Smith River), Del Norte County, California. Only 46 goby populations were believed extant at the time of listing, representing an approximate 50 percent decline of known populations (USFWS 1999e). In 1999, an estimated 85 tidewater goby populations were believed to be extant and the number of historical populations was estimated to be about 110 (USFWS 1999e). Of the 13 historic sites in Orange and San Diego counties, only 8 populations of gobies remain, with all locations occurring on Camp Pendleton (USFWS 2000a).

Overall, gobies are not present in all habitats during every month, and their distribution and density may vary seasonally and spatially. On Camp Pendleton, the extirpation and recolonization of gobies fluctuate yearly between lagoons. Tidewater gobies were recorded in San Onofre lagoon from 1974 to 1991, but could not be found in 1993 or 1994. In contrast, 1996 surveys of San Onofre found the goby population rise to 12,265. Surveys conducted in San Mateo drainage during 1992 found no gobies, in 1994, the estimated population was 292 and in 1996 there was a substantial increase in population estimated at 73,500.

Tidewater goby occurrences on Camp Pendleton, from 1987 through 2001, are shown in Table 3-8. Prior to the flooding of 1993, there were four known populations of tidewater gobies remaining south of the Santa Clara River, Ventura County, all of which are located on Camp Pendleton. The gobies had been found in the lagoons at San Onofre Creek, Las Flores Creek, Santa Margarita River, and Cockleburrr Creek. No gobies were found in the San Mateo lagoon. After the flooding in 1993, a survey was conducted and found gobies present in San Mateo lagoon, but absent from the Santa Margarita River and San Onofre lagoon. Furthermore, high flow events do not necessarily result in local extirpation of goby populations. Recent observations, suggest that flood events function as dispersal mechanism by washing gobies out to the littoral zone of the ocean where they are carried by longshore currents to other estuaries down coast (Lafferty et al. 1999). These populations comprised approximately 6.4 to 7 percent of the total remaining population of the species (Holland 1992). Figure 3-5 illustrates the general distribution of the tidewater goby on Camp Pendleton.

The tidewater goby occurs in the coastal, brackish-water habitats in the lower reaches of coastal rivers, streams, lagoons, and occasionally small lakes or ponds. They typically occur in shallow (< 1.0 meter) quiet to slow moving water (Irwin & Stoltz 1984) and avoid fast moving waters. Gobies for the most part are associated with mud, sand, gravel, and cobble bottom substrates. Tidewater gobies have been found in salinities ranging from 0 to 28 parts per thousand (ppt) (Irwin & Stoltz 1984) and are most commonly found in salinities <10 ppt (Swift 1989). The species tolerance of high salinities (up to 60 ppt for varying time periods) likely enables it to withstand exposure to the marine environment, allowing it to colonize or reestablish in lagoons and estuaries (USFWS 2000a). Tidewater gobies feed primarily on small benthic invertebrates, crustaceans, including aquatic insect larvae, snails, and shrimp.

Threats. – The major factors affecting the tidewater goby are direct loss of wetland habitat to coastal development, drought, and flooding. In addition to directly affecting the goby, these factors are also responsible for indirect loss of habitat due to associated changes in salinity, temperature, and nutrient profiles; increased siltation; associated changes in substrate; and changes in current flows. This may affect the size, distribution, and breeding and foraging activities of the goby (Holland 1992). Other potential threats to tidewater gobies are nonnative predators or competitors, including sunfish (*Centrarchidae*), largemouth bass (*Micropterus salmoides*), striped bass (*Morone saxatilis*), channel catfish (*Ictalurus punctatus*), mosquitofish, and yellowfin gobies (*Acanthogobius flavimanus*).

TABLE 3-8. Tidewater goby survey data for different drainages at Camp Pendleton (data sources: Holland et al. 2001; Michael Brandman Associates 1998; Swift & Holland 1998; Swift et al. 1994; Swift 1999a, 1999b).^a

Year	Drainage							
	San Mateo	San Onofre	Las Flores	Hidden	Aliso	French	Cockleburrr	Santa Margarita
1987	-	+	+	U	U	U	-	U
1988	-	+	+	U	U	U	-	+
1989	-	+	+	U	U	U	-	+
1990	-	+	+	U	-	-	-	+
1991	-	+	+	U	-	-	-	+
1992	U	-	+	U	UA	UA	+	U
1993	+	-	+	+	-	-	+	-
1994	UP	U	UP	UP	U	U	UP	UA
1995	+	U	UP	UP	U	U	UP	UA
1996	+	+	+	+	+	+	+	-
1997	+	+	+	+	+	+	+	-
1998	+/- ^b	+	+	+	+	+	+	-
1999	-	+	UP	UP	UP	UP	UP	-
2000	+	+	+	+	+	+/- ^c	+	+
2001	+	+	+	+	+	-	+	+

^a Survey data codes: (+) present; (-) absent; (U) Unknown (no sampling or survey data); (UA) Unknown but likely absent; (UP) Unknown but likely present.

^b Extirpated by North County Transit District in early 1998.

^c Present in June 2000, extirpated by October 2000.

3.2.3.14 ARROYO TOAD

Status. – The arroyo toad (*Bufo californicus*) was listed as a federally endangered species on 16 December 1994 (USFWS 1994e). The USFWS designated critical habitat for the arroyo toad on 7 February 2001 (USFWS 2001d,e). Portions of Camp Pendleton outside of the leased lands on San Mateo Creek were excluded from designated under Section 4(b)(2) to ensure that mission critical military training activities can continue while the INRMP and programmatic uplands consultation are being completed (USFWS 2001d,e). A recovery plan has been approved for this species (USFWS 1999f).

Distribution and Occurrence. – On Camp Pendleton, the arroyo toad occurs only in three drainages (Figure 3-5): Santa Margarita, San Onofre, and San Mateo. The population in the Santa Margarita drainage represents the only one occurring on an undammed major river system within southern California (Holland & Goodman 1998a). Endemic to southern California, arroyo toads were found historically along the length of drainages from southern California south into northwestern Baja California, but now they survive only in the headwaters as small isolated populations (Sweet 1993). The recovery plan (USFWS 1999f) identifies 22 drainage basins with recorded arroyo toad sightings since the early part of the

twentieth century. Two of the drainages had only single, unverified records at each, and arroyo toads are believed to be extirpated from a third drainage. Therefore, Camp Pendleton contains 3 of the remaining 19 drainage basins where arroyo toads are reasonably believed to be extant. It is likely that some of the largest remaining populations of this species occur on Camp Pendleton (Holland & Goodman 1998a). The lower portions of the San Mateo Creek basin, the San Onofre Creek, and Santa Margarita River, all of which are located on Camp Pendleton, may be the only remaining coastal plain lands in southern California on which the arroyo toad occurs within 10 kilometers (6 miles) of the coastline and down to the coastal marsh zone (USFWS 1999f). Arroyo toad use of upland habitat region wide is poorly understood.

Threats. – Habitat destruction and population isolation has put arroyo toads at a risk of extinction. Threats to arroyo toad survival include stream channel modification, exotic plants, fire, and exotic predators. Channeling streams increases flow rates, which reduces the availability of breeding habitat. Exotic plants such as water cress (*Rorippa* spp.) and giant reed (*Arundo donax*) directly and indirectly affect the condition and formation of ideal breeding pools. Fire may directly kill toads by burning their refugia and indirectly affect breeding habitat by increasing the rate of water flow. Disturbances such as fire, agriculture, and road construction can increase sedimentation in arroyo toad breeding pools, rendering them unusable. Older larvae fall prey to exotic fish and crayfish (Jennings & Hayes 1994). Bullfrogs are voracious predators that eat adult toads and are suspected of eating larvae and metamorphs. Arroyo toads are also killed by vehicular traffic and road maintenance.

3.2.3.15 RIVERSIDE FAIRY SHRIMP

Status. – The USFWS listed the Riverside fairy shrimp (*Streptocephalus woottoni*) as federally endangered on 3 August 1993 (USFWS 1993c). Critical habitat for this species has been proposed (USFWS 2000c). A recovery plan has been approved for the listed species of southern California vernal pools (USFWS 1998d).

Distribution and Occurrence. – The range of the Riverside fairy shrimp is from Orange County and southwestern Riverside County south to Otay Mesa on the Mexican border and continuing down into Baja California. The coastal mesas on Camp Pendleton support one of the largest known populations of this species, with at least 81 pools occupied by shrimp (73 with Riverside fairy shrimp and 8 with both Riverside fairy shrimp and San Diego fairy shrimp) (RECON 1998a). These 81 pools represent about 60% (81 of 135) of all known Riverside fairy shrimp occupied pools (Moeur 1998).

Initial reconnaissance surveys for Riverside fairy shrimp were conducted in 1993 and began at the bluffs and small mesa southwest of the I-5 southbound rest stop (White Beach) and radiated outward from there. Much of the area contained mima mound topography. The greatest number of Riverside fairy shrimp occupied pools was found near the White Beach rest stop on both sides of I-5 (Figure 3-5). Basewide survey efforts were conducted by RECON in the 1997/98 wet season. The draft report (RECON 1998a) of the results from those surveys indicate that Riverside fairy shrimp, eight of which are also occupied by San Diego fairy shrimp, occupies 81 pools.

Threats. – The Riverside fairy shrimp is threatened by habitat loss and degradation due to urban and agricultural development, off-road vehicle use, trampling, and other factors. Further fragmentation and destruction of isolated vernal pool groups can also have subtle but significant adverse effects. Zedler (1987) found that species diversity within vernal pools and genetic diversity within a single species are evenly distributed throughout a given group of pools and between groups of pools. Thus, preservation of fewer pools may reduce the overall genetic variability of the species, conceivably affecting its long term viability. Theoretically, even those areas specifically set aside to protect vernal pools may exhibit significant deterioration of viability if compromised by continued isolation and fragmentation of remaining pools (Bauder 1986).

3.2.3.16 SAN DIEGO FAIRY SHRIMP

Status. – The San Diego fairy shrimp (*Branchinecta sandiegonensis*) was listed as federally endangered on 3 February 1997 (USFWS 1997c). The USFWS has recently designated, critical habitat for this species. The San Diego fairy shrimp is included in the approved recovery plan for the listed species of southern California vernal pools (USFWS 1998d).

Distribution and Occurrence. – San Diego fairy shrimp are restricted to vernal pools in coastal southern California south to extreme northwestern Baja California, with San Diego County supporting the largest number of remaining occupied vernal pools (USFWS 2000d). The USFWS (2000d) estimated at the time of listing that fewer than 202 acres of occupied vernal pool habitat remained in San Diego County, of which an estimated 70 percent was estimated to occur on military lands.

On Camp Pendleton, the San Diego fairy shrimp shares the same coastal strip distribution as the Riverside fairy shrimp. However, within this limited range, especially in the southwestern part of the Base, the San Diego fairy shrimp occurs more often than either Lindahl's fairy shrimp (*Branchinecta lindahli*) or Riverside fairy shrimp. On the Base, San Diego fairy shrimp appears to be locally abundant in natural vernal pools and in man-made pools that have not been disturbed in several seasons (Moeur 1998). Generally speaking, vernal pools of high natural quality will be occupied by San Diego fairy shrimp while more degraded pools have a greater likelihood of containing Lindahl's fairy shrimp. San Diego fairy shrimp occur primarily in Victor, Oscar One, and Oscar Two training areas and in the Wire Mountain housing area (Figure 3-5). Basewide survey efforts were conducted by RECON in the 1997/98 wet season. The draft report (RECON 1998a) of the results from those surveys indicates that 216 pools are occupied by San Diego fairy shrimp, eight of which are also occupied by Riverside fairy shrimp.

Threats. – Regionally, the San Diego fairy shrimp is threatened by habitat destruction from urban and water development, flood control, highway and utility projects, as well as conversion of wildlands to agricultural use. Changes in hydrologic pattern, overgrazing, and off-road vehicle activity also imperil this species.

3.2.3.17 SAN DIEGO BUTTON-CELERY

Status. – San Diego button-celery (*Eryngium aristulatum* var. *parishii*) was proposed for listing as endangered on 3 August 1993 (USFWS 1993c). Critical habitat has not been proposed for this species. San Diego button-celery is included in the approved recovery plan for the listed species of southern California vernal pools (USFWS 1998d).

Distribution and Occurrence. – San Diego button-celery ranges from Riverside County, California, south to northern Baja California, Mexico (Constance 1977). In 1979, San Diego button-celery was known from 65 pool groups; by 1986, this species remained in 61 pool groups (USFWS 1993c). Currently, it occurs in the Santa Rosa Plateau in Riverside County; in northern San Diego County on Camp Pendleton; and in San Marcos, Carlsbad, and Ramona. It also occurs on the northern mesas within the City of San Diego and on Otay Mesa in southern San Diego County.

On Camp Pendleton, San Diego button-celery has been found in a total of 67 vernal pools basewide, with 14 occupied pools occurring along the coast (Victor, Red Beach, and White Beach areas), 52 occupied pools inland near the Wire Mountain housing development, and 1 occupied pool within the Oscar One training area (Figure 3-5). The known locations of San Diego button-celery on Base are a compilation of multiple survey efforts (some basewide, others site specific) over many years. The earliest known survey that identified this species on Base was conducted by Pacific Southwest Biological Services, Inc. (1986). Years later, Dudek & Associates, Inc. (1996) conducted a basewide rare plant survey and was the first to map San Diego button-celery locations on Base using GPS technology. During their basewide surveys in 1997, RECON (1998b) identified an additional 44 pools containing San Diego button-celery (included in the total above).

Threats. – San Diego button-celery, as with other vernal pool species, is threatened by the loss of habitat. In general, vernal pool habitat in San Diego County has declined 97 percent (from 23,859 ha to 838 ha) since the early 1900s (Oberbauer 1990). Most of the remaining vernal pools, particularly in San Diego County, face threats from increasing urban development. The USFWS has identified several other threats, including agricultural development, off-road vehicular activity, trampling by people and livestock, roadway development, military activities, and watershed (drainage) alteration.

3.2.3.18 SPREADING NAVARRETIA

Status. – Spreading navarretia (*Navarretia fossalis*) was listed as threatened on 13 October 1998 (USFWS 1998e). Critical habitat for this species has not been proposed. Spreading navarretia is included in the approved recovery plan for the listed species of southern California vernal pools (USFWS 1998d).

Distribution and Occurrence. – Currently, Spreading navarretia is known from widely disjunct and highly restricted populations extending from the Santa Clarita region of Los Angeles County, east to the western lowlands of Riverside County, south through coastal and foothill San Diego County, and as far south as San Quentin in northern Baja California,

Mexico. Fewer than 30 populations exist in the United States. Nearly 60 percent of these populations are concentrated in three locations in southern California: Otay Mesa in southern San Diego County, the San Jacinto River in western Riverside County, and Hemet in Riverside County.

On Camp Pendleton spreading navarretia has been found in 9 vernal pools basewide, 7 pools in the Wire Mountain housing development area and 2 pools within the Oscar One training area (Figure 3-5). The known locations of spreading navarretia on Base are a compilation of multiple survey efforts (some basewide, others site specific) over many years. During surveys of the Base in the late 1980s, Pacific Southwest Biological Services, Inc. (1986, 1987, 1988, & 1990) identified only one population of spreading navarretia on the mesa east of Newton Canyon. In 1993, the species was found in at least three additional nearby sites (Dudek 1993). Spreading navarretia was also discovered in a large vernal pool at the edge of a lawn near Camp Del Mar, west of Interstate 5, near the southern end of the Base. During their basewide surveys in 1997, RECON (1998b) identified nine vernal pools with spreading navarretia.

Threats. – Spreading navarretia, as with other vernal pool species, is threatened by the loss of vernal pool habitat. In general, vernal pool habitat in San Diego County has declined 97 percent (from 23,859 ha to 838 ha) since the early 1900s (Oberbauer 1990). Most of the remaining vernal pools, particularly in San Diego County, face threats from increasing urban development. The USFWS has identified several other threats, including agricultural development, pipeline construction, drained or channelized wetlands, off-road vehicle activity, cattle and sheep grazing, weed abatement, fire suppression activities, and competition from nonnative plant species.

3.2.3.19 THREAD-LEAVED BRODIAEA

Status. – Thread-leaved brodiaea (*Brodiaea filifolia*) was listed by the USFWS as a threatened species on 13 October 1998 (USFWS 1998e). The USFWS found that designation of "critical habitat" for this species was not prudent at that time because such designation would provide no benefit over that provided by listing on privately owned lands (USFWS 1998e). Critical habitat for this species has not been proposed. No recovery plan has been approved.

Distribution and Occurrence. – The historical range of thread-leaved brodiaea extends from the foothills of the San Gabriel Mountains at Glendora (Los Angeles County), east to Arrowhead Hot Springs in the western foothills of the San Bernardino Mountains (San Bernardino County), and south through eastern Orange and western Riverside Counties to Carlsbad in northwestern San Diego County, California. A small isolated population of thread-leaved brodiaea is situated just west of Rancho Bernardo in central San Diego County (Morey 1995; CDFG 1997; Roberts & Vanderwier 1997).

Sixty populations of thread-leaved brodiaea have been reported, including the populations at Camp Pendleton. At least 9 of these populations have been extirpated, primarily in San Diego County. Fifty-one populations are presumed extant. Less than half of these remaining

populations are clustered in the expanding cities of Vista, San Marcos, and Carlsbad (9 populations) and in the vicinity of the Santa Rosa Plateau (6 populations). The remaining 35 populations are scattered within Orange, Los Angeles, Riverside, San Bernardino, and San Diego counties.

Thread-leaved brodiaea occupies an estimated 825 acres of suitable habitat. Of this habitat, 40% is reported from a single area, Miller Peak just north of the Base. The majority of the populations are within 2- to 10-acre patches. Because individuals require several years to mature and frequently only a fraction of mature individuals flower in a given year, the total number of individuals within a population is difficult to estimate. Moreover, the size and extent of populations of thread-leaved brodiaea within suitable habitat also vary in response to the timing and amount of rainfall, as well as temperature patterns. Fewer than 500 individuals have been observed within half of the populations. Populations exceeding 5,000 flowering stalks have been reported in only six localities (CDFG 1997; Roberts & Vanderwier 1997). Several populations have also significantly hybridized with other brodiaea species, such as Orcutt's brodiaea (*Brodiaea orcuttii*) and Mesa brodiaea (*B. jolonensis*), where these species co-occur (Morey 1995).

On Camp Pendleton, thread-leaved brodiaea has been found at 22 general localities, within which may be multiple sites. Thread-leaved brodiaea was first located on Base in 1993 during surveys in what are now Bravo One and Bravo Two training areas (Dudek & Associates 1993). During those surveys, several large populations (up to 2,000 individuals each) were discovered.

In 1997, most of the known thread-leaved brodiaea sites were visited during another basewide rare plant survey (RECON 1998c). This survey examined most of the potential thread-leaved brodiaea habitat, and an additional 14 sites were discovered. These new locations were all identified on clay pan soils within the Las Flores Mesa area of Oscar Two training area and in the Talega Canyon area of Charlie training area. It should be noted that many of the 1997 surveys were conducted early in the blooming season in order to detect the presence of early season clay endemics, such as Blochman's Dudleya (*Dudleya blochmaniae*) and Palmer's grapplinghook (*Harpagonella palmeri*). Thread-leaved brodiaea, however, is a late season clay endemic; therefore, early season survey efforts may have failed to detect some locations for this species (RECON 1998c). As mentioned above, seven new sites were recorded in the Spring 2000, bringing the total number of sites to 22. These new sites are located in the following training and cantonment areas: Bravo One, Bravo Two, 52 Area, Alfa One, India and Golf. Figure 3-5 illustrates the general distribution of thread-leaved brodiaea on Base.

Threats. – The USFWS has identified several threats to this species across its range, including habitat destruction, degradation, and fragmentation resulting from agriculture, urbanization, pipeline construction, alteration of wetland hydrology, clay mining, off-road vehicle activity, weed abatement, and invasive nonnative plant species.

Over the past 15 years, nearly 60 ha (148 ac) of occupied habitat containing over 80,000 plants have been eliminated in the cities of San Marcos and Vista. Remaining populations of thread-leaved brodiaea occupy less than 243 ha (600 ac) of habitat. The total number of

individuals of this species and the extent of occupied habitat vary on an annual basis in direct response to both the timing and amount of rainfall as well as temperature patterns. Most extant locations of this species contain fewer than 2,000 plants and often occupy less than 16 ha (40 ac) of habitat.

3.2.4 Landscape Linkages and Wildlife Corridors

Landscape (or habitat) linkages are open space natural areas that provide connectivity among and between habitat patches, and provide locations for native plants and seasonal or year-round habitat for wildlife. Linkages may also provide wildlife corridors (see below) for the movement of individuals or populations between habitat areas.

The identification, conservation, and protection of landscape linkages and wildlife corridors are essential to the long term sustainability of many species in the southern California region. The increasing fragmentation of open space areas by urbanization has created small, isolated “islands” of habitat. Both empirical studies and evolutionary theory have shown that small, genetically isolated populations are particularly vulnerable to extinction. In the absence of habitat linkages and wildlife corridors that allow movement to adjoining open space areas, various studies have concluded that some species, especially the larger and more mobile mammals, will not likely persist over time (MacArthur & Wilson 1967; Soule 1987; Harris & Gallagher 1989; Bennett 1990). Corridors connecting the larger patches of natural habitat areas and open spaces mitigate the effects of this fragmentation, to some degree, by: (1) allowing gene flow (interbreeding and genetic exchange) between otherwise small and genetically isolated populations; (2) providing escape routes from fire, predators, human disturbances, and other potentially catastrophic events that could result in local extinction; and (3) serving as travel routes for individual animals as they move within their home ranges in search of food, water, mates, and other needs (Noss 1983; Farhig & Merriam 1985; Simberloff & Cox 1987; Harris & Gallagher 1989).

The largely undeveloped, contiguous stretches of habitat on Camp Pendleton function as one of the last remaining landscape linkages, and the only remaining coastal linkage, between the few remaining open spaces in Los Angeles and Orange Counties to the north, Riverside County to the northeast, and northern San Diego County to the south. While Camp Pendleton may be large enough to maintain self-sustaining populations of some species for a reasonably long period of time, the long term sustainability of most species (both within the region and on Base) will likely be threatened should habitat linkages and wildlife corridors between the Base and surrounding areas be effectively removed.

3.2.4.1 WILDLIFE CORRIDOR DEFINITIONS

Wildlife corridors are narrow connections among and between habitat patches that are intended to allow for wildlife movement and dispersal. Wildlife corridors can be viewed as being local (e.g., within Camp Pendleton) or regional. Local corridors are important because they allow resident wildlife access to resources and they function as connections to habitat patches in the surrounding region. Wildlife corridors often follow major drainages and open

ridgelines. In general, wildlife corridors link together areas of suitable wildlife habitat that are otherwise separated by rugged terrain, changes in vegetation, or human disturbance.

Wildlife movement activities usually fall into one of three categories: (1) dispersal (e.g., juvenile animals from natal areas, individuals extending range distributions); (2) seasonal migration; and (3) movements related to home range activities (foraging for food or water, defending territories, searching for mates, breeding areas, or cover). A number of terms have been used in various wildlife movement studies, such as “travel routes,” “wildlife corridors,” “habitat linkages,” and “wildlife crossings,” to refer to areas in which wildlife move from one area to another. To clarify the meaning of these terms and facilitate discussions on wildlife movement, these terms are defined as follows:

- Travel routes: A landscape (such as a ridgeline, drainage, canyon or riparian strip) within a larger natural habitat area that is used frequently by animals to facilitate movement and provide access to necessary resources (e.g., water, food cover, den sites). The travel route is generally preferred because it provides the least amount of topographic resistance in moving from one area to another; it contains adequate food, water, and/or cover while moving between habitat areas; and provides a relatively direct link between target habitat areas.
- Wildlife corridor: A piece of habitat, usually linear in nature, that connects two or more habitat patches that would otherwise be fragmented or isolated from one another. Urban land areas or other areas unsuitable for wildlife usually border wildlife corridors. The corridor generally contains suitable cover, food and/or water to support species and facilitate movement while in the corridor. Larger, landscape-level corridors (often referred to generally as “habitat or landscape linkages”) can provide both transitory and resident habitat for a variety of species.
- Wildlife crossing: A small, narrow area relatively short in length and generally constricted in nature, that allows wildlife to pass under or through an obstacle or barrier that otherwise hinders or prevents movement. Crossings typically are manmade and include culverts, underpasses, drainage pipes, and tunnels to provide access across or under roads, highways, pipelines, or other physical obstacles. These often represent “choke points” along a wildlife corridor.

It is important to note that, within a large open space area in which there are few or no man-made or naturally occurring physical constraints to wildlife movement, wildlife corridors, as defined above, may not yet exist. Given an open space area that is both large enough to maintain viable populations of species and provide a variety of travel routes (canyons, ridgelines, trails, riverbeds, and others), wildlife will use these “local” routes while searching for food, water, shelter, and mates, and will not need to cross into other large open space areas. Based on their size, location, vegetative composition, and availability of food, some of these movement areas (e.g., large drainages and canyons) are used for longer lengths of time and serve as source areas for food, water, and cover, particularly for small and medium-sized animals. This is especially true if the travel route is within a large open space area. However, once open space areas become constrained and/or fragmented as a result of urban development or construction of physical obstacles such as roads and highways, remaining

landscape features or travel routes that connect the larger open space areas can “become” corridors, as long as they provide adequate space, cover, food, and water, and do not contain obstacles or distractions (manmade noise, lighting) that would generally hinder wildlife movement.

3.2.4.2 CAMP PENDLETON WILDLIFE CORRIDORS

Many of the open space areas within and adjacent to Camp Pendleton to the northeast within the Cleveland National Forest are generally large enough to support varied and abundant resident plant and wildlife populations and to provide for unrestricted movement between the Base and adjacent open space lands. The large habitat areas of the Base also allow generally unrestricted access to the north, toward permanently designated open space areas of the Cleveland National Forest, Casper’s Wilderness Park, O’Neill Regional Park, Rancho Mission Viejo Land Conservancy, and Thomas F. Riley Wilderness Park (formerly called Wagon Wheel Regional Park).

While there are likely a number of preferred travel routes and landscape features that larger and more mobile wildlife species may use to move within and between permanent open space areas, wildlife “corridors,” have not been formally studied and documented within the open space habitat areas surrounding the Base, nor on Camp Pendleton. This is essentially because these Camp Pendleton and adjacent, permanently designated open space areas (parks and national forests) have generally not been constrained or reduced to the point of artificially creating, or necessitating, development of wildlife corridors. However, with current and proposed future development planned for many of the areas between the parks, national forests, Camp Pendleton and other permanently designated open space areas, any remaining landscape linkages could “become” wildlife corridors in the near future.

Wildlife movement on Base is facilitated by the fact that Camp Pendleton contains several watersheds and several small coastal drainages. Although water flows are intermittent across these drainages, they support abundant riparian woodland, scrub, and wetland vegetation communities within the floodplain areas, and coastal sage, chaparral or grassland vegetation on canyon slopes and along ridgelines. These areas provide food and cover for many wildlife species on the Base in addition to facilitating wildlife movement basewide. Potential east-west wildlife movement on Camp Pendleton can occur along the Santa Margarita River, and Las Flores, Aliso, and San Onofre canyons, portions of the San Mateo and San Luis Rey Rivers, and along several small coastal drainages. San Onofre Creek, San Mateo Creek, and the Santa Margarita River offer the best direct connection for wildlife, albeit highly restricted by the I-5 corridor, to the beaches and coastal bluffs of Camp Pendleton.

Like most of southern California’s streams and river systems, water flows are only intermittent in most of the drainages on Camp Pendleton. Drainages, like the Santa Margarita, provide food and cover for many wildlife species on Base, and facilitate wildlife movement from coastal and foothill areas eastward to the Santa Ana Mountains in the Cleveland National Forest.

Potential north-south wildlife movement occurs on Camp Pendleton through the inland

mountains situated along the eastern half of the base, and those of the coastal belt located just east of the I-5 corridor. Other potential north-south wildlife movement on Camp Pendleton may include the along the beaches, coastal benches/bluffs, and foothills that are, for the most part, unconstrained by development and other artificial barriers.

Urban development over the past 30 years has severely reduced the expanse of once common native vegetation and wildlife habitats that existed north of Camp Pendleton in the foothills and valleys situated between the coastal and the steep terrain of the Cleveland National Forest. Many remaining vegetation communities have become fragmented, isolated and constrained by regional development. This trend is expected to continue and even accelerate, given regional population projections unless regional conservation planning efforts and land set-asides are established.

At present, regional conservation efforts are focused on crafting remaining open space areas into a reserve system that is expected to provide larger, core biological areas and both landscape linkages and wildlife corridors that connect onto Base lands. The central/coastal Orange County NCCP plan, approved in 1996, set aside more than 37,000 acres of open space lands as mitigation for anticipated future development in the region. The southern Orange County NCCP plan, which is still undergoing development and approval by region stakeholders, is also expected to set aside tens of thousands of acres of open space lands as mitigation for anticipated future development. Upon final approval of a collective reserve design for southern Orange County, these lands will be incorporated into a regional network of wildlife preserves and mitigation set-asides. These lands are expected to provide needed landscape linkages necessary to help ensure Camp Pendleton's existing and future open space lands and natural resource assets do not become isolated as an island within a sea of fragmented, patchy vegetation, sparse open space parks and urban sprawl. It is assumed that a majority of the remaining lands situated outside planned wildlife reserves and mitigation set-asides in southern Orange County, from the coast to the Santa Ana Mountains, will be developed for residential, commercial or industrial uses.

While it is acknowledged that military development trends on Base over the past 60 years pose some modest constraint to existing wildlife movement, selected portions of the Base's landscape have become increasingly constrained over the years by nonmilitary entities development actions on Base lands (e.g., I-5, railroad). Such development not only acts to inhibit wildlife movement both across, and to and from, selected portions of Camp Pendleton, it constrains military training activities, and jeopardizes the military readiness capability of the Base.

South of Camp Pendleton, open space lands are not being consumed quite as rapidly in comparison to those to the north. Remaining open space lands, however, are considered small, highly fragmented parcels, with little native vegetation. Many of these parcels are in an urban setting and are severely limited in their capacity to support movement of any kind by native wildlife species, beyond very localized movement.

The nearest available open space areas to the south that are contiguous with Camp Pendleton are situated immediately adjacent to the Base's southern boundary along the floodplain and adjacent slopes of the San Luis Rey River. Larger open space areas south of the Base exist

within the central part of the City of Oceanside, north of Oceanside Blvd. and east of El Camino Real. This site, however, is a former agricultural field that contains little in the way of native vegetation. Additional open space lands exist further south, along State Route 78 and Buena Vista Creek, and further south in the northeastern and southeastern portions of the City of Carlsbad. The only potential direct linkage corridor between Camp Pendleton and those isolated parcels to the south is provided by the San Diego Gas & Electric's transmission corridor easement, much of which is highly disturbed, cleared or heavily influenced by edge effects from nearby urban developments. The Draft Oceanside Subarea Plan to the MHCP proposes a "stepping-stone" landscape linkage to allow dispersal north-south across Oceanside between Camp Pendleton and north Carlsbad for coastal sage scrub bird species.

CHAPTER 4

NATURAL RESOURCES MANAGEMENT

This chapter presents an overview of natural resources management for MCB and MCAS Camp Pendleton. Base natural resources management consists of a suite of conservation and management programs, each with program specific goals, objectives, and planned actions. These policies, goals, objectives, and planned actions were developed and prioritized to achieve Camp Pendleton's overarching natural resource management goals, incorporate the principles of ecosystem management in all programs, and support the military operational and support requirements of the Base.

The natural resources management programs are organized into general categories (many of which are further sub-divided), including: (1) ecosystem management; (2) natural resources inventory; (3) wetlands, estuary/coastal, and riparian management; (4) wildlife management; (5) threatened and endangered species management; (6) exotic invasive species control; (7) watershed management; (8) grounds maintenance and landscaping; (9) grazing and agricultural outleases; (10) fire management; (11) environmental planning; and (12) information management. Natural resource related recreation and education programs are presented within Chapter 5. Under each objective within the natural resources management program are a series of planned actions. Where planned actions support more than one management program objective they are repeated under different subsections within this chapter and Chapter 5.

Also presented within this chapter are the mechanisms and processes in place for the implementation, oversight, integration, and enforcement of natural resources management programs and planned actions. These mechanisms and processes are key to the success of natural resources management and to the long term capability of Base lands to support the military mission.

4.0 NATURAL RESOURCES MANAGEMENT OVERVIEW

The Sikes Act defines the purpose of natural resources management on military lands as 'the conservation and rehabilitation of natural resources on military installations; the sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and nonconsumptive uses; and, subject to safety requirements and military security, public access to military installations to facilitate the use [of these resources].' Camp Pendleton has long recognized the value of its resources and has continued to invest in their conservation and management over the years. Camp Pendleton's history of practicing responsible stewardship while accommodating multiple land uses dates back as far as the mid-1950s and early 1960s, beginning with a cooperative agreement with state fish and game biologists to establish a Base hunting and fishing program. Since then, the nation's growing awareness of issues concerning pollution, habitat loss, and land degradation has resulted in an increase in environmental protection legislation (e.g., Migratory Bird Treaty Act [1918], Sikes Act [1960], NEPA [1969], Clean Air Act [1970], the ESA [1973, as amended], CWA [1977],

etc.). Camp Pendleton has likewise increased its investment in regulatory compliance and stewardship as is exhibited by the addition of staff devoted to natural resources management and the myriad of programs and projects the Base has funded and performed over the years.

By virtue of its vast amount of open space and its compliance and stewardship initiatives, Camp Pendleton has contributed substantially to regional biodiversity conservation and planning efforts. In doing this, the Base has also been able to maintain a degree of flexibility in the implementation of the military mission and natural resources management. This approach takes a long term view of human activities, integrating military uses and requirements with the conservation and management of biological resources.

4.0.1 Philosophy, Guiding Principles, and General Approach

Camp Pendleton's natural resource management philosophy is that management programs should achieve the objectives of regulatory requirements and foster stewardship of the resources entrusted to Marine Corps while not constraining the ability to accomplish established and future military training requirements. Camp Pendleton's intent is to preclude long term damage and degradation to training lands by managing natural resources through processes and programs in accordance with the following guiding principles:

- Sustain and restore ecosystem dynamics, such that the native plant and animal communities on Base are sufficiently resilient to withstand an expanded array of disturbances and incursions occasioned by military mission requirements on Camp Pendleton;
- Manage native vegetation to promote optimal community succession for ecosystem integrity with a focus on sensitive species. Native plant communities should be maintained by natural processes and not be artificially manipulated, except as needed to restore depleted natural resources, or where areas are isolated from natural dynamics of the ecosystem;
- Enhance the value of ecosystems by eradicating exotic plant species, promoting native plant communities, preventing new weed introduction and restoring areas to their original conditions after disturbance;
- Minimize occurrence of wildfires caused by Base activities through the Fire Danger Rating system and controlled/prescribed burns in coordination with adjacent land managers;
- Achieve greater biological diversity and distribution of native species, especially federal threatened and endangered species populations, throughout the region/ecosystem;
- Establish self-sustaining populations of listed species that require little human intervention for maintenance; and

- Develop effective partnerships among private and government agencies.

Although much of Camp Pendleton's current approach to natural resources management and stewardship involves maintaining compliance with applicable laws and regulations, which are inherently species and resource specific, several of the existing programs (e.g., erosion control, fire management, exotics control, listed species management) either directly or indirectly support an ecosystem management approach. To the extent that federally listed species are indicators of the health of habitats and ecosystems, listed species protection programs are used by the Base to provide umbrella coverage for other, non-listed native species and habitats. Camp Pendleton's Riparian and Beach/Estuarine Conservation Plans (USFWS 1995a) exemplify this umbrella coverage in their approach to threatened and endangered species management. Although the impetus for the Riparian and Beach/Estuarine Conservation Plans was for the protection of federally listed species, the effect of the plans has been to improve riparian and beach/estuarine habitats for all ecosystem users, including other native species and human users of the Base.

Camp Pendleton's ongoing natural resource conservation and management involves:

- The avoidance and minimization of adverse effects to federally listed species and sensitive resources through the implementation of programmatic instructions (published rules and guidelines for land users on Base)" and the NEPA process for evaluation of potential impacts of new activities and projects;
- Native habitat maintenance and enhancement through the implementation of the programmatic conservation plans, fire management, exotics control, erosion control, pollution prevention, water quality management, etc.; and
- Monitoring and surveying to understand and track the Base's inventory of species and habitats and using this data to evaluate the status, quality, distribution, and trends of those resources and management plans.

The Base's natural resources conservation and management programs will continue to be directed toward achieving the overarching natural resource management goals identified within Section 1.4.2 of this INRMP. To ensure that individual programs at Camp Pendleton are working towards in an ecosystem approach, Camp Pendleton is using the ongoing INRMP process to develop a vision of desired future conditions that integrates ecological, socioeconomic, and institutional perspectives. This vision will incorporate a regional perspective and be developed in collaboration with appropriate regional land use, management, and planning agencies.

An important aspect to Camp Pendleton's natural resources management is the establishment of cooperative relationships with state and federal fish and wildlife agencies. While the Base is required to consult with federal agencies to ensure compliance with legal requirements, Camp Pendleton also recognizes and values the professional expertise and experience of federal and state fish and wildlife agency personnel for other than compliance related issues.

Cooperative relationships are becoming increasingly important as Camp Pendleton and the region continues to evolve towards an ecosystem based approach to management.

Ultimately, the success of Camp Pendleton's natural resources management is reflected in the long term sustainability of species populations and ecosystem functions, the maintenance of regulatory compliance, and in the continued ability of Camp Pendleton to support the military mission. Over time, many factors upon which this INRMP is based are likely to change, including military mission requirements, the federal list of threatened and endangered species, knowledge of the ecology and requirements of the listed species, as well as an understanding of the nature of anthropogenic impacts to those species. The integration and implementation of the Base's natural resources management and this INRMP will follow an adaptive management approach that acknowledges uncertainty, monitors the various components of the INRMP, and learns from experience with the end goal of improving future management actions. Adaptive management can be described as a system for attaining "resilience in the face of surprise" (Lee 1993). Ultimately, the success of this INRMP depends upon both its ability to conserve natural resources through time and its ability to accommodate the Base's present and future mission requirements. Simply stated, success depends upon adaptation.

4.0.1.1 PROGRAM GOALS AND OBJECTIVES

In addition to the three overarching natural resources management goals presented within Section 1.4.2, each natural resources management program (e.g., erosion control, fire management, exotics control, listed species management) has individual goals and objectives. The intent of the program specific goals is to be visionary, ideal, and general in character and to provide long term guidance in defining the direction and purpose of the program. Objectives within each program represent shorter-term benchmarks to help meet program specific goals. Due to the breadth of management programs and planned actions within this INRMP, the objectives are generally not quantitative. Nonetheless, they are important in establishing the conditions that must be met to achieve program specific goals.

4.0.1.2 PLANNED ACTIONS, TIMELINES, AND FUNDING

The planned actions presented within the management programs in this chapter (and Chapter 5) represent the ongoing and anticipated actions that the Base has developed to ensure compliance with regulatory requirements, to facilitate implementation of protocols and procedures, to help meet natural resources management goals and objectives, and to address specific issues or needs. Planned actions contribute to the accomplishment of one or more management program objectives. Where a planned action supports more than one management program objective it is repeated under each appropriate objective throughout this chapter and Chapter 5. To aid the reader, planned actions have been cross-referenced when they apply to more than one program objective within the document.

Planned actions are classified as either Priority Planned Actions or Other Planned Actions. Priority Planned Actions are those projects and actions that Camp Pendleton has committed

to accomplishing and/or are required by laws, regulations, or other agreement. Other Planned Actions are those projects and actions that Camp Pendleton desires to accomplish, but cannot commit to undertaking due to restrictions and limitations on fiscal and personnel resources. Priority Planned Actions presented in this chapter were developed in consideration of DoD and Marine Corps policies and directives to: (1) achieve Camp Pendleton's natural resource management goals, (2) incorporate the principles of ecosystem management, and (3) support the military operational requirements of the Base. Camp Pendleton is committed to implementing each Priority Planned Actions by the end of the calendar year noted after the action. Actions identified as "ongoing" are carried out each year or as required.

Other Planned Actions represent desired, but not essential, actions that will further support the military mission, enhance the integration of natural resources management, or support stewardship of resources entrusted to the Marine Corps. Within each natural resources management program, Other Planned Actions are prioritized to assist in the determination of which action(s) is(are) to be accomplished first should funding/resources become available. The prioritization of Other Planned Actions is relative to the Other Planned Actions within that program. The same Other Planned Action can have different prioritization rankings if it occurs within more than one program (e.g., it may be a higher priority for the accomplishment of one program objective as compared with another objective). In no case does an Other Planned Action appear as a Priority Planned Action, or vice versa.

The prioritization of the Other Planned Actions is denoted in the following manner: one asterisk (*) after the planned action means that the action is of lesser priority within the program relative to the remaining Other Planned Actions in that program; two asterisks (**) indicate an Other Planned Action which has a moderate level of priority; and three asterisks (***) represents the highest level of priority for an Other Planned Action.

Development and tracking of planned actions provides a framework for evaluating timely progression of INRMP implementation. Where possible and desirable, the Base has tried to be specific in the language of the planned actions. It is not possible to be more specific with some planned action because they are still being developed or depend on results of other, earlier actions. It is also not desirable to be more specific with some planned actions to allow the flexibility necessary for adaptive management.

It is important to emphasize that all planned actions have one or more sponsoring agent within the Base. These sponsors are responsible for the planning, budgeting, implementation, and tracking of actions. Costs associated with the execution of Priority Planned Actions and Other Planned Actions required identification at the earliest practicable stage of a proposed action. The Base organization responsible for implementation of the action is responsible for budgeting for and funding the action.

4.0.1.3 FISH AND WILDLIFE INTER-AGENCY COORDINATION

Camp Pendleton has been, and continues to be, involved in coordinated management and partnering efforts with fish and wildlife agencies at both the state (California Department of Fish and Game) and federal (U.S. Fish and Wildlife Service) levels. Many of the components

of Camp Pendleton's Natural Resources Management Program that have been implemented over the last few decades were developed in coordination with the CDFG or USFWS, including the hunting and fishing programs and federally listed threatened and endangered species management.

Sikes Act provisions and cooperative agreements for outdoor recreation, such as hunting and fishing, are implemented nationally by a MOU between the DoD and DoI. Locally, Camp Pendleton has a draft Outdoor Recreation Plan, the completion of which is a planned action identified within this INRMP. The final Outdoor Recreation Plan is to be included in future revisions of this INRMP and, therefore, will be reviewed by state and federal wildlife agencies.

Although later superseded by the Riparian BO programmatic consultation (USFWS 1995a), the 1986 USFWS/Camp Pendleton MOU for management of endangered least Bell's vireos on the Santa Margarita River provided the first ecosystem based approach within the DoD covering more than 10,000 acres of sensitive riparian wetlands, coastal estuaries, beaches, and dune areas. It developed an agreement on, and framework for, species specific management of Camp Pendleton's contribution to the region's endangered least Bell's vireos population.

In addition to working with the USFWS on regulatory and management issues, Camp Pendleton has contracted staff from the Federal Projects Branch of the USFWS to conduct surveys, research, and monitoring on Base. Examples of these projects include southern steelhead trout (*Oncorhynchus mykiss*) habitat suitability survey (USFWS 1998f), Pacific pocket mouse monitoring (USFWS 1999c), snowy plover surveying (Collier & Terp 2000), upland habitat restoration and maintenance for federally listed species (in progress), survey of the status of wildlife watering devices (USFWS 2001f).

Camp Pendleton has also participated in quarterly partnering sessions with the Navy and USFWS. These sessions have generated partnering efforts such as dispute resolution, the development of a mutually agreed upon format for biological assessments, and an arroyo toad symposium (held at MCAS in October 2000).

4.0.2 Program Implementation: Oversight, Integration, Compliance, and Enforcement

While integration, implementation, and enforcement are a part of all the programs in this INRMP, this section highlights some of the initiatives geared specifically toward serving those functions. Included in this section are the (1) organizations and processes involved in oversight and integration; (2) use of programmatic instructions; (3) environmental inspection and compliance; and (4) enforcement mechanisms. Other initiatives and processes that are important to the implementation and integration of this INRMP can be found elsewhere in the document. For example, essential to INRMP implementation is the funding of programs (and planned actions), which is presented in Section 1.7. Moreover, no single initiative or process presented within this section is solely capable of ensuring successful integration,

implementation, or enforcement of natural resource programs, nor do any of these initiatives serve as a substitute for the established staff action process.

4.0.2.1 OVERSIGHT AND INTEGRATION

The lead organization on MCB Camp Pendleton for overseeing and coordinating environmental issues is the Assistant Chief of Staff, Environmental Security (see Figure 1-2, and Appendix H). Aboard the Air Station, the Environmental Officer provides the policy development, program oversight, data management, and regulatory liaison for natural and cultural resources. Although MCAS is under a separate command structure and has its own staff, Marine Corps Base and MCAS staffs regularly collaborate to ensure that management and planning efforts are coordinated between the installations.

Integration of the INRMP not only requires a coordination of efforts among the natural resources management programs and planned actions, but also an integration of land *management* with land *use* (training, maintenance, recreation, etc.). The integration and coordination of land management efforts is achieved, in part, through the evaluation and update of the INRMP itself. This review process, which is coordinated for the entire Base by the Planning Branch within the Resource Planning Division of AC/S ES, provides a venue for evaluation, discussions of adaptive management, presentation of ideas for improvement, and assessment of progress towards goals and objectives with Base staff and resource agencies. The INRMP review process not only helps assure that the management actions are achieved, but provides for an evaluation of the integration of, and consistency among, the planned actions. Areas that are identified as not well integrated will be appropriately addressed (e.g., some planned actions may be added to the INRMP as a result of this process).

Several mechanisms and processes help ensure the integration of land management with land use. These are described in other sections within the INRMP and include, but are not limited to, the use of programmatic instructions (Section 4.0.2.2); the NEPA process (Section 4.12); planning and project support (Section 4.12); environmental training, education, and awareness programs (Section 5.5); and information and Geographic Information Systems management (Section 4.14).

4.0.2.2 PROGRAMMATIC INSTRUCTIONS

Programmatic instructions (PIs) represent the published “general rules” which regulate and guide Base activities (e.g., military training, maintenance, construction, and outdoor recreation). By providing a programmatic operational framework for military and civilian users of the Base without the burden of unnecessary technical detail, PIs provide flexibility in concert with species/ecosystem conservation and help ensure avoidance and/or minimization of adverse impacts to federally listed species and other sensitive resources. Many PIs are applicable basewide and help minimize impacts to the environment in general (e.g., fire danger ratings); however, other PIs may be specific to actual locations of listed species (e.g.,

least Tern nesting sites) or to general areas of the Base (e.g., riparian habitat and range and training areas).

Camp Pendleton PIs also serve to provide the USFWS with a framework for issuance of terms and conditions within Biological Opinions. Programmatic instructions presented in Biological Assessments and terms and conditions within BOs are incorporated into appropriate implementing documents and Base directives.

As “general rules,” programmatic instructions are disseminated by various methods including Base Orders, Base Bulletins, and as special conditions in documents approving recurring activities. Key methods for disseminating PIs are listed in the following paragraphs.

Base Orders

The Base Range and Training Regulations (BO P3500.1_) provide information, instructions, and procedures governing the use of ranges, training areas, and airspace operated and controlled by Camp Pendleton (see Appendix Q for excerpts from most current version of regulations, BO P3500.1K). Included in this order are specific programmatic instructions that address how units training on and over Camp Pendleton are to operate under given conditions. Conditions addressed include the various Fire Danger Ratings, basewide environmental procedures, areas off limits to training, and natural resource considerations and restrictions.

The Base Regulations (BO P5000.2J) establish the responsibilities and procedures that govern the conduct of all persons and activities at Camp Pendleton. Within the Base Regulations is a chapter on Environmental Security with sections that outline the Base policies governing natural and cultural resources and environmental compliance and protection. Also within the Base Regulations is a section on housing regulations, including the Base’s policy on the possession of pets (most exotic pets are prohibited basewide and housing areas adjacent to sensitive resources have restrictions on the possession of normal domestic household pets, such as dogs and cats).

Environmental Compliance and Protection Standard Operating Procedures

Commanders of Marine Corps installations are responsible for the publication of a single environmental compliance and protection standard operating procedures (ECPSOP) document. A single ECPSOP for an installation ensures continuity of effort and prevents conflicts in policies between the various environmental media programs. The ECPSOP is complementary to, but not redundant with, the Marine Corps Order P5090.2A (Marine Corps Environmental Compliance and Protection Manual) and contains material compiled from existing Base Orders, Standard Operating Procedures, Biological Opinions, etc. MCAS published its own ECPSOP, which is presently being updated.

Environmental Guidebook

The Camp Pendleton Environmental Guidebook is a quick-reference introduction to environmental issues, laws, and regulations confronting Marines, sailors, soldiers, and civilian employees on Camp Pendleton. The guidebook provides points of contact for users of the Base to obtain further information.

Categorical Exclusions

The Council on Environmental Quality (CEQ) and DoN regulations provide for the establishment of categorical exclusions (CXs) for actions that have been found to have no significant effect individually or cumulatively on the human environment and, therefore, for which neither an Environmental Assessment nor an Environmental Impact Statement is required. CXs apply to only those kinds of actions that do not significantly affect the quality of the human environment, that result in no significant change from existing conditions at the site of the proposed action, or whose effect is primarily economic or social. A Decision Memorandum is used to document the use of a CX. The strict conditions associated with the use of CXs and the extensive array and locations of sensitive resources at Camp Pendleton has necessitated the inclusion of PIs in those Decision Memoranda. These PIs include project/location specific and general basewide instructions for avoiding impacts and ensuring that actions remain under the approved CX.

Architectural and Engineering Environmental Guidebook

The Air Station has published an Architectural and Engineering Environmental Guidebook for dissemination to contractors. The Architectural and Engineering Environmental Guidebook provides information, instructions, and procedures for environmentally sound designs and construction.

4.0.2.3 ENVIRONMENTAL INSPECTION AND COMPLIANCE

Monitoring the success of natural resource management is part of the role of the Marine Corps Environmental Compliance and Evaluation program, the Self-Audit Program, and the Annual Plan of Action and Milestones. The Marine Corps conducts internal environmental and natural resource audits and inspections through its Environmental Compliance Evaluation Program. Camp Pendleton's Environmental Inspection and Compliance Program is consistent with Marine Corps guidance and policy, and consists of HQMC conducted Benchmark ECE assessments and annual Self-Audits conducted by both MCB and MCAS Camp Pendleton.

Marine Corps Environmental Compliance Evaluation (ECE)

HQMC-sponsored Benchmark ECEs are conducted once every 3 years, with a formal Annual Validation of POA&M (described below) report provided during intervening years. The results are used as a tool for the commander and the Commandant of the Marine Corps to plan, program, budget, and execute initiatives to achieve compliance. Comparison of the Benchmark ECE results is made for overall trend analysis Marine Corps wide. HQMC has established the following goals for the ECE Program:

- To provide the commander with a tool to evaluate the command's environmental compliance
- To assess compliance levels and, as required, provide recommended corrective actions or improvements
- To provide a forum for the exchange of ideas and successes
- To provide the CMC with a broad evaluation of environmental compliance across the Marine Corps
- To provide a formal interface among installations, Fleet Marine Forces commanders, and the Inspector General of the Marine Corps
- To integrate environmental awareness into every facet and function of the Marine Corps way of life
- To improve overall compliance efforts through a continuous, integrated program

The ECE is an evaluation similar to those conducted by the Inspector General of the Marine Corps or Field Supply Maintenance Analysis Office and is designed to provide commanders with an assessment of their environmental compliance status. It assesses the command's level of compliance, identifies actions necessary to correct deficiencies, provides follow up on the implementation of those proposed actions, and facilitates continuous improvement in compliance efforts through the Self-Audit Program

In order to standardize ECEs and ensure all environmental requirements are properly and thoroughly evaluated, a Windows-based automated database comprised of checklists for use by commanders and ECE teams was developed. This Automated Compliance Evaluation (ACE) software is the only authorized software for tracking Marine Corps environmental compliance efforts. ACE is a large database comprised of several checklists. The ACE database presents all known federal requirements applicable across Marine Corps installations, specific state and local requirements unique to each installation, and requirements specified in the ECE Manual. To avoid any misinterpretation of requirements, the ACE system uses the exact requirements from the applicable source document to formulate questions. ACE provides the commander with a vehicle to evaluate the command's environmental compliance position by identifying actual environmental requirements. As a listing of specific requirements, it serves as a quick reference to installation users. ACE can be modified by the installation user to fit specific Marine Corps commands/units and tenants or media evaluations. Installation and command unique requirements, such as Camp Pendleton's use of the local Air Pollution Control District's Rule 6, have been built directly into the ACE database for Camp Pendleton. The most important management feature of the ACE database is the generation of a POA&M for each ECE or inspection conducted. The

CMC updates the installation unique ACE software annually with each installation receiving a specific checklist based upon state and local requirements.

Annual Environmental Compliance Evaluation (Self-Audit Program)

Working in conjunction with the CMC sponsored ECE, MCB and MCAS Camp Pendleton each conduct an annual ECE as part of a Self-Audit Program. These Self-Audit Programs serve as an internal plan for the Commanding General, MCB Camp Pendleton and the Commanding Officer, MCAS Camp Pendleton to assess compliance throughout their commands, including all tenant commands and activities. These Self-Audit Programs use the ACE software and the HQMC provided list of requirements as a tool to track compliance. The goal of these Self-Audit Programs is to assess compliance by annually visiting every permitted site and source, and every process potentially subject to an environmental requirement including all natural resource programs and BO terms and conditions. These annual self-audits verify that all requirements are met and ensure the effectiveness of environmental programs. The Inspection and Compliance Division of AC/S ES coordinates MCB Camp Pendleton's Self-Audit program and the MCAS Environmental Management Department coordinates the MCAS Camp Pendleton Self-Audit Program.

Annual Plan of Action and Milestones (POA&M) Process

An integral part of all evaluations conducted on Base is appropriate follow-up to ensure that corrective actions are completed. ACE allows an evaluated commander to develop and track the command's POA&M as part of the ECE documentation. Installation commanders must use this capability in developing and maintaining POA&Ms that result from the HQMC sponsored ECEs. Commanders are also encouraged to use the POA&M capability as part of their Self-Audit Programs. Once a year on the anniversary of the most recent Benchmark ECE, the installation commander evaluates, updates, and forwards the POA&M to the HQMC. This POA&M is the primary requirement and document supporting the "Annual Validation of ECE POA&M."

The Annual Validation of the Benchmark ECE POA&M meets the EPA recommendation to follow up formally on Benchmark ECE deficiencies. It replaced the Program Management Review and should not be confused with the Self-Audit Program. The installation commander conducts an annual review and verification of the POA&M from the most recent Benchmark ECE. This process certifies that reviews and validation of the POA&M are complete. It includes copies of the updated POA&M and the environmental self-audit schedule of the installation's Commanding General's Inspection Program as enclosures.

4.0.2.4 ENFORCEMENT

Several organizations on Base provide enforcement capability to help ensure compliance with natural resource laws, regulations, and management initiatives. These include the Range Operations Division (AC/S O&T), Resource Enforcement and Compliance Branch (AC/S

ES), Provost Marshal's Offices (AC/S Installation Security Safety and MCAS), Semper Fit Division (AC/S Marine Corps Community Services), and the Resident Officer in Charge of Construction (AC/S Facilities) described below (see also Figures 1-1, 1-2, and Appendix H).

Natural resources management and planning staff within AC/S Environmental Security and MCAS Environmental Department also contribute to the enforcement of laws, regulations, and management initiatives. The Assistant Chief of Staff Environmental Security has developed, and is in the process of implementing, an Environmental Incident Reporting System for the documentation and tracking of all environmental incidents (including non-compliance with Biological Opinion terms and conditions). Also, to improve existing tracking and monitoring of NEPA projects, mitigation, and compliance with permits, the AC/S ES is in the process of developing a computer based NEPA project tracking program (E-Trax) and a mitigation database (see Section 4.12.1).

Violations documented by Base organizations responsible for compliance are reported in accordance with existing regulations to the appropriate state or federal agency and Headquarters, Marine Corps. Violations are referred to the Base Commanding General or the Commanding Officer MCAS for determination regarding investigation, adjudication, and corrective and/or punitive action. Law enforcement aboard the Base associated with individual actions beyond official federal duties, including poaching, is the responsibility of the Provost Marshal's Office, or other entity as directed by the Commanding General, with technical assistance from the Natural Resources Department (AC/S ES). Occasionally, the services of state and federal fish and wildlife agency enforcement personnel are involved where their technical expertise or extra manpower is needed. Marine Corps policy is to permit access to installation lands by federal, state, and local conservation personnel for official purposes after proper safety and security measures are taken (HQMC 1998).

Range Operations Division, AC/S Operations and Training

The Range Operations Division, AC/S O&T is the on-site controlling agency for all ranges, training areas, and air/sea space, providing a safe, three dimensional, and realistic training environments with real time resolution of scheduling conflicts and control and coordination of training activities. As part of its management function, the Range Operations Division inspects ranges, training facilities, and training areas to ensure safe use and compliance with appropriate directives, including BO P3500.1_ (*Base Range and Training Regulations*), which includes the Fire Danger Rating System and programmatic instructions protecting sensitive natural resources.

Resource Enforcement and Compliance Branch, AC/S Environmental Security

The Resource Enforcement and Compliance Branch (RECB) under the AC/S ES is staffed with Game Wardens and Deputy Game Wardens. The RECB is responsible for ensuring that fish and wildlife laws on Camp Pendleton are enforced in accordance with federal and state laws, Marine Corps Orders, annual Base Bulletins, and other applicable regulations. The RECB provides personnel who are authorized as federal officers to enforce state and federal

Fish and Game regulations and administer the Base's hunting, fishing, camping, and other outdoor recreational programs.

The Conservation Supervisor/Game Warden Supervisor is Camp Pendleton's law enforcement official for federal and state laws and regulations pertaining to fish, wildlife, and natural resources. The Conservation Supervisor/Game Warden Supervisor appoints Game Wardens and Deputy Game Wardens as required. Game Wardens and Deputy Game Wardens are authorized to conduct searches pertinent to fish, wildlife and natural resources, in accordance with federal and state laws, BO P5821.1 (Standard Operating Procedures for Legal Matters), and other Base regulations.

Duties of the Game Warden within the RECB include:

- Enforcement of natural resource regulations
- Enforcement of campfire restrictions
- Administration of the hunting, fishing, and undeveloped camping programs
- Patrolling the Base
- Implementing habitat conservation programs
- Responding to inquiries or problems involving wildlife
- Recovering selected injured wildlife and road kills
- Confiscating exotic pets
- Giving educational and instructional briefs to users of the Base
- Monitoring the locations of the Base's resident bison herd

Federal Citations (DD Form 1805) are used for violations of federal Fish and Wildlife laws. A copy of DD Form 1805 is forwarded to the Staff Judge Advocate with a complete report prepared by the issuing officer describing the circumstances surrounding the alleged violation. Personnel are not detained by Deputy Game Wardens after citations have been issued. Resource contraband is seized and noted on the citation and in the report. Citations are adjudicated in the Federal Court in San Diego.

A Camp Pendleton Base Citation may be used to cite military personnel for violations of Base, federal or state regulations. A copy of the Base Citation is forwarded to the Commanding Officer of the person being cited with a complete report prepared by the issuing officer (if requested) describing the circumstances surrounding the alleged violation. Commanding Officers have the authority to impose punitive and non-punitive punishment under the Uniform Code of Military Justice for violations of regulations.

Provost Marshal's Office (PMO)

The Provost Marshal's Offices of MCB and MCAS provide overall law enforcement and physical security for Camp Pendleton and enforce federal and state laws and military regulations. Military Police provide physical security for and patrol Camp Pendleton. Working in conjunction with Range Operations Division and Game Wardens, the Military Police enforce restrictions and closures of areas to nonmilitary activities and apprehend

civilian and military personnel involved in unauthorized activities in natural resource and training areas.

Semper Fit Division, AC/S Marine Corps Community Services (MCCS)

The Semper Fit Division of AC/S MCCS operates the recreation program aboard Camp Pendleton including recreation at the beaches and developed campgrounds. Lifeguards and management personnel control patrons activities in accordance with PIs established to help avoid and/or minimize adverse impacts to sensitive resources located near beaches and recreation facilities. In addition, beach campgrounds have a volunteer night host residing on site who helps provide after hours supervision.

Resident Officer in Charge of Construction (ROICC)

The Resident Officer in Charge of Construction is the command under the Naval Facilities Engineering Command, Southwest Division that is responsible for the post contract award administration of construction, maintenance, and repair projects. Among other responsibilities, the ROICC serves as a Contracting Officer, empowered to obligate the federal government and to enforce the contractual requirements for which a given contractor is responsible. In as much as NEPA documentation, permit and mitigation requirements are often passed along to the construction, maintenance, or repair contractor, the ROICC enforces the contract requirements including these environmental requirements and/or actions.

4.1 ECOSYSTEM MANAGEMENT

The long term success of conservation efforts, both on Base and within the region, depends upon natural resource management at the ecosystem level. Ecosystems are complex and dynamic by nature, with components that are interrelated and operating at different rates. The distribution and abundance of species and communities and underlying ecological and physical processes occur irrespective of land ownership or management boundaries. An ecosystem functions as a whole, not as a collection of parts; yet, its integrity may be disrupted by excessive “interference” of any single component. Thus, conservation and management initiatives that operate within arbitrary boundaries and fail to recognize the interconnectedness of processes within the larger context of an ecosystem may unduly waste scarce resources or, worse, contribute to greater ecological problems in the long term.

The DoD has recognized the value of ecosystem management and has established principles and guidelines for natural resource managers on military installations (Section 1.3.3). Ecosystem management require a shift from the management of single species or habitats to the management of multiple species and habitats. Regulatory requirements (e.g, ESA) have historically fostered a greater emphasis on species-by-species management approach. Camp Pendleton’s more recent endeavors (e.g., the Riparian and Estuarine/Beach Ecosystem Management Plans) better reflect the principles of ecosystem management. However, Camp

Pendleton's future vision of its natural resource management is to further develop, promote, and refine its comprehensive, ecosystem based management program. The aim of this approach is to promote the conservation of native species and habitats, ensure the sustainability and biological diversity of terrestrial and aquatic ecosystems, and facilitate maximum support of the Base's military training mission and infrastructure, while simultaneously ensuring compliance with applicable laws and regulations.

Successful ecosystem management strategies will require innovative and new approaches to land use decisions and regional involvement. Camp Pendleton is working to define and understand its regional relevance and is committed to fulfill its responsibility to regional conservation efforts. Ecosystem management is innovative, requiring the use of the best available scientific information in decision making and adaptive management techniques. It requires the cooperation of and participation with external agencies and forming partnerships necessary to assess and manage ecosystems that cross political boundaries.

GOAL: Manage Camp Pendleton's natural resources using an ecosystem management approach.

GOAL: Conserve the full range of extant vegetation communities.

GOAL: Maintain functional wildlife corridors and habitat linkages between critical biological resources and with regional linkages.

4.1.1 General Ecosystem Management on Camp Pendleton

Camp Pendleton's natural resources management programs will continue to be directed toward achieving natural resource management goals. To ensure that individual programs at Camp Pendleton are working towards an ecosystem approach, it is important to develop a vision of desired future conditions that integrates ecological, socioeconomic, and institutional perspectives. This vision should incorporate a regional perspective and be developed in collaboration with appropriate regional land use, management, and planning agencies (see also Section 4.1.2).

An important component of ecosystem management is adaptive management. Because our knowledge of ecological systems and processes is inherently limited (due in part to changing conditions), we must continuously learn how to better manage. Flexibility and adaptation in the face of uncertainty are critical (Leslie et al. 1996). At the heart of adaptive management is a willingness to approach all management decisions as experiments to be tested (Leslie et al. 1996). Hypothesis testing, assessments of the efficacy of management techniques, and incorporation of knowledge gained over time are key to successful adaptive management.

OBJECTIVE: Develop a collaborative vision of desired future conditions that integrates ecological, socioeconomic, and institutional perspectives, applied with a geographic framework defined primarily by natural ecological boundaries.

Priority Planned Actions:

- In collaboration with Camp Pendleton land users, federal, state, tribal, local governments, nongovernmental organizations, private organizations, and the public, develop a shared vision of what constitutes desirable future ecosystem conditions. 2003. [Also applies to Sections 4.1.2, first objective; 4.4.1.]
- In collaboration with Camp Pendleton land users, federal, state, tribal, local governments, nongovernmental organizations, private organizations, and the public develop a shared vision of what constitutes desirable future watershed conditions for the Santa Margarita River and the San Mateo Creek. 2003. [Also applies to Sections 4.1.2, first objective; 4.7.2, first objective.]

OBJECTIVE: Develop a framework for performing adaptive management.

Priority Planned Actions:

- Develop and implement a formal lessons learned protocol to facilitate adaptive management. 2002.
- Develop and implement an Adaptive Management Plan for MCAS. 2002. [Also applies to Section 4.12.5.]

4.1.2 Regional Planning, Partnering, and Involvement

Ecosystem management requires the stewardship of resources on Base as well as involvement at the regional level. While the management and protection of natural resources within the Base's boundaries are important (and contribute to regional conservation efforts), Camp Pendleton recognizes that long term sustainability of ecosystem processes and watershed functioning requires a regional perspective and a coordination of efforts to achieve common goals. Adequate provision for, and promotion of, biodiversity conservation within the region surrounding Camp Pendleton will help to ensure functioning landscape linkages and wildlife corridors to Base ecosystems.

Implementation of an ecosystem approach requires decision making on a host of issues, both local and regional, short and long term, and involvement by many different groups operating at many different organizational levels. Depending upon the issue, the level of involvement by the Base ranges from passive vigilance to active participation. In all situations of regional involvement, effective communication and the fostering of positive, long lasting relations with surrounding communities and diverse interest groups greatly improves the success of the natural resources program and benefits the overall status of the Base.

Camp Pendleton is working to ensure that its land use and regional planning efforts are complementary with surrounding biodiversity conservation efforts such that Base lands help support the region's habitat conservation needs while also providing continued support of the Base's mission. Part of this effort involves actively monitoring and/or providing input to each of the following regional conservation planning and research efforts: (1) County of San Diego's MSCP, (2) North San Diego County MHCP, (3) North County Wildlife Forum, (4) the Coordinated Resource Management Planning group, which consists primarily of major federal and state land managers in support of regional biodiversity; (5) South and Central-Coastal Orange County Subregional plans, and (6) Riverside County's Multiple Species and Habitats Conservation Plan and the new Riverside County Integrated Planning program.

Camp Pendleton encourages local, state, and federal involvement and participation in regional biodiversity conservation and management planning that ensures the continued existence of all species and resources of regional importance, consistent with existing land uses and regional economic needs. Examples of such initiatives that Camp Pendleton is currently involved with include:

- Santa Margarita River Watershed Management Program,
- Team Arundo Watershed Exotics Control,
- Santa Margarita and San Luis Rey Weed Management Area Program,
- Santa Margarita Ecological Reserve,
- The Nature Conservancy Cooperative Agreement (signed in 1988) for the maintenance of biological diversity on DoD installations, and
- Camp Pendleton Alternative Futures Study.

Another form of regional involvement is the generation and sharing of regionally useful data. Much of the knowledge gained from data derived on the Base can be directly applicable to issues of regional concern and has a clear benefit to local and regional management and planning efforts. Base sponsored research, surveys, and monitoring contribute to the regional understanding of species, habitats, and ecosystem dynamics. In fact, several studies on Base have been part of larger, regional projects. For example, survey sites on Base have contributed to the international Monitoring Avian Productivity and Survivorship program (Section 4.4.2) and to a regional study of the diversity and autecology of amphibians and reptiles within the California portion of the California Floristic Province (Fisher 2000; data from these herpetological survey sites have also contributed to Holland & Goodman 1998a,b). Lastly, symposia, such as the arroyo toad symposium sponsored by MCAS in 2000 (see Section 5.5), also contribute to regional conservation and management initiatives in that they may facilitate the interaction of, and sharing of information among, public and private agency professionals.

Camp Pendleton routinely makes available and provides data and copies of completed reports and surveys conducted on Base and is partnering with several groups to improve regional sharing of ecological data. The Base is participating in a regional Geographic Information System database information exchange with SANDAG to enhance documentation of regional biodiversity. The Base is also working with The Nature Conservancy and San Diego State

University to develop a riparian monitoring program related to its pending water rights settlement-agreement with Rancho California Water District. To that end, the Marine Corps has provided \$100,000 of Legacy funding to San Diego State University (SDSU) to develop a web-accessible data base for hydrology, water quality, sediment, and habitat and biocriteria data. SDSU's work is part of a larger regional effort to develop an Internet environmental data transfer system to support regional planning and research. At the same time, Camp Pendleton is participating in an effort, funded initially by the U.S. Bureau of Reclamation, to develop a science-based, watershed-scale water quality monitoring program. That effort also includes database design, and the Base is coordinating between the Reclamation consultants and SDSU, to avoid duplication or contradiction in their work products.

In addition to contributing to the region through Base funded surveys and research, Camp Pendleton also supports limited non-Base funded research by providing access to the Base, when compatible with military training, safety, and natural resource management goals, for qualified research projects that are regional in nature. Such projects often support one or more natural resources management program goals and objectives as well as contribute to the Base's overarching natural resource management goal of encouraging regional plans and incentives that address conservation of native biodiversity, ecosystem sustainability, and watershed management issues. Examples of non-Base funded research supported over the last several years include the following:

- California Gnatcatcher Habitat Utilization Research : Bill Wirtz (Pomona College)
- Monarch Butterfly (*Danaus plexippus*) Overwintering: Dave Marriott (The Monarch Program)
- Golden Eagle Survey (*Aquila chrysaetos*) of San Diego County: Dave Bittner and John Oakley (Eagle Survey Project)
- Status of Golden Eagle Population on Camp Pendleton: Peter Bloom (Independent Researcher)
- Long-Term Raptor Population Research: Peter Bloom (Independent Researcher)
- San Diego Bird Atlas: Phil Unitt (San Diego Natural History Museum)
- Foraging Behavior of Terns in Southern California: Dan Robinette and Patricia Heron Baird (California State University at Long Beach)
- Arroyo Toad Movement, Mortality, and Habitat Utilization in San Mateo Creek: Paul Griffin (University of California at San Diego)
- Capacity of the Santa Margarita River to assimilate nitrite and other constituents associated with treated sewage effluent: Rancho California Water District

Another form of regional involvement and partnering by the Base is through public education and awareness programs (see also Section 5.5). Environmental staffs conduct frequent slide presentations on natural resources and Base management programs to a variety of on-Base and off-Base groups such as conservation organizations, service groups, and college classes. Base personnel also lead field trips to observe wildlife and discuss management programs. Group tours have included an annual tour for the Friends of the Santa Margarita River, the Biodiversity Research Consortium, National Research Council, and regulatory agencies. During 1998, a major Earth Day celebration was held on Base and involved live animal

displays of local reptiles, birds, and various mammals. News articles are prepared periodically for the Base paper and interviews are given frequently to local newspapers. Staff also participates with local high schools in a School-to-Career program, orienting students monthly to the environmental compliance and natural resource management professions, education requirements, and expertise being exercised at the Base.

OBJECTIVE: Develop a collaborative vision of desired future conditions that integrates ecological, socioeconomic, and institutional perspectives, applied with a geographic framework defined primarily by natural ecological boundaries.

Priority Planned Actions:

- In collaboration with Camp Pendleton land users, federal, state, tribal, local governments, nongovernmental organizations, private organizations, and the public, develop a shared vision of what constitutes desirable future ecosystem conditions. 2003. [Also applies to Sections 4.1.1, first objective; 4.4.1.]
- In collaboration with Camp Pendleton land users, federal, state, tribal, local governments, nongovernmental organizations, private organizations, and the public develop a shared vision of what constitutes desirable future watershed conditions for the Santa Margarita River and the San Mateo Creek. 2003. [Also applies to Sections 4.1.1, first objective; 4.7.2, first objective.]

OBJECTIVE: Develop an understanding and involvement in other regional ecosystem based conservation plans.

Priority Planned Actions:

- Obtain available vegetation data for areas that are surrounding and adjacent to Camp Pendleton and enter it into a GIS database. 2002. [Also applies to Section 4.2.1, first objective.]
- Assess the feasibility and desirability of conducting off-Base surveys of selected species and habitat types, water quality monitoring, and hydrographical surveys to contribute to the understanding of Camp Pendleton's regional contribution to species and habitat conservation and recovery. 2003. [Also applies to Sections 4.2.1, first objective; 4.2.2, first and second objectives; 4.5.2, first and second objectives.]
- Sponsor/support scientific research in support of regional understanding and Base management goals by qualified personnel. Ongoing. [Also applies to Sections 4.2.2, third objective; 4.4.2, second objective.]
- Develop a decision support framework for performing ecosystem management. 2002.

- Maintain a regional planning database and perspective on regional plans, habitat conservation plans, and other initiatives in the Riverside, Orange, and San Diego County Area. Ongoing.
- Evaluate the feasibility of participating in cooperative watershed restoration programs, including cooperating with local governmental and nongovernmental stakeholders. Ongoing. [Also applies to Sections 4.3.1, first objective; 4.5.4; 4.7.1, first objective.]
- Participate in regional forums and planning initiatives for the removal of invasive, exotic species. Ongoing. [Also applies to Sections 4.6.1; 4.6.2.]

4.2 NATURAL RESOURCES INVENTORY

Maintaining a natural resources inventory helps guide land use, land management, and restoration decisions that facilitate the sustainability of military activity over time. Camp Pendleton's natural resources inventory is largely, but not entirely, a GIS based assemblage of data reflecting (1) distribution and abundance (size, density) parameters for a range of taxa and plant community and habitat types on Base and (2) physical characteristics, processes, and changes, including soil types, tide levels, water quality, and the frequency and extent of wildland fire and erosion. Additional information for some species/resources, such as habitat quality, number of breeding individuals, and an accounting of incidental take, is also part of the Base's inventory.

Data within the inventory are generated from a variety of sources and at different scales, including project specific surveys, species specific monitoring, community based surveys, research projects, and surveys of anthropogenic impacts. Many of the surveys and monitoring efforts on Base are driven by regulatory requirements (e.g., USFWS Biological Opinion terms and conditions, NEPA procedures, etc.). As funding becomes available, additional surveys are conducted to augment the Base's inventory of information on natural resources (e.g., in the past the Base has funded reptile, amphibian, and bat surveys). The Base periodically accepts proposals from qualified outside investigators who wish to survey and monitor other populations or communities. This policy has resulted in reports that catalog Camp Pendleton's insect and arachnid species, and annual status of golden eagle (*Aquila chrysaetos*) and other raptor nests.

The establishment and maintenance of a natural resources inventory is an essential component of conservation and adaptive management (U.S. DoD 1996). It enables the tracking of changes over time, contributes to an understanding of the structure and function of the larger ecosystem to which the Base belongs, assists project specific and master planning efforts, and facilitates an evaluation of impacts and the effectiveness of management efforts. Ultimately, maintenance of the natural resources inventory enables the efficient and effective accomplishment of management program goals and objectives.

GOAL: Develop and maintain an inventory of natural resources to support management programs and the ability to conserve and enhance native fauna and flora and the functional value of natural systems.

GOAL: Categorize natural processes and impacts to natural resources through monitoring, investigative research, and data analysis in order to make informed decisions necessary for maintaining training lands.

GOAL: Continue to develop and maintain comprehensive data collection and processing systems to facilitate informed management decisions.

GOAL: Ensure that scientifically sound and commonly accepted data collection methods and sampling techniques are used to update natural resource inventories.

4.2.1 Vegetation and Habitat Mapping

Fundamental to the understanding of land use and land management capabilities, and the assessment of community and ecosystem health, is the identification of vegetation types and their distribution on Base (along with climate, available moisture, and other physical features of a landscape). Vegetation largely determines the type and distribution of animals that can be supported by a system. Compared to animal populations, vegetation is relatively stable over time. Therefore, the required frequency for vegetation mapping is less than that for animals. Nonetheless, the description, classification, and mapping of vegetation on Base are not without complexities. For example, there is no universally agreed upon method for describing or classifying vegetation, although Holland (1986), Sawyer and Keeler-Wolf (1995), and The Jepson Manual (Hickman 1993) are commonly cited vegetation classification references in California. The assemblage of species within vegetation types varies continuously. No two hillsides have exactly the same vegetation. On southern Californian shrub lands, it is common to have a “patchwork” or mosaic of small blocks of different community types with indistinct transition zones between them.

The GIS vegetation coverage currently in use by Camp Pendleton’s natural resource managers and planners was originated by the San Diego Association of Governments in the early 1990s, and updated in 1995. SANDAG’s vegetation mapping was part of a countywide effort to support the region’s habitat conservation planning efforts. Thus, the SANDAG vegetation databases are regional in nature, varying in levels of detail and scale. Finer vegetation details were collapsed into broader categories and limited field reconnaissance was conducted in the mapping efforts.

Due to its limited size, MCAS has collected vegetation data at a higher resolution than the rest of the Base (with the exception of site specific surveys for projects). A vegetation survey of MCAS was recently completed and is expected to serve as the primary planning data set over the next five years. Moreover, floodplain and wetlands delineations have been completed for the entire Air Station.

OBJECTIVE: Develop and maintain an inventory of vegetation and selected habitat types on Camp Pendleton and in surrounding communities (e.g., distributions, occurrences, incidental take, photographic archive, etc.), using high quality and up-to-date GIS maps where appropriate and desirable.

Priority Planned Actions:

- Track plant community distribution, habitat function and value, and vegetation age classes. Ongoing. [Also applies to Sections 4.3.1, first objective; 4.3.4.] [Compliance requirement of Riparian BO (T&C, Appx 4, p.1)]
- Ensure that all GIS layers from surveys conducted on Camp Pendleton are in a format that meets specified in-house criteria (Appendix R). Ongoing.
- Annually update fuel load hazard mapping. Ongoing. [Also applies to Section 4.11.1.]
- Continue to develop a GIS wetlands mapping coverage for Camp Pendleton that supports proactive planning and impact avoidance. Ongoing. [Also applies to Sections 4.3.1, first objective; 4.3.2.]
- Maintain high quality and up-to-date GIS mapping of vernal pools on Camp Pendleton that supports proactive planning and avoidance of impacts. Ongoing. [Also applies to Section 4.3.2.]
- Conduct high-resolution aerial photography of the riparian and estuarine areas on Camp Pendleton every two years. 2002, 2004, 2006. [Also applies to Sections 4.3.1, first objective; 4.3.4.] [Compliance requirement of Riparian BO (Recom p. 39; T&C, Appx 4, p. 1; T&C, Appx 5, p. 4)]
- Obtain available vegetation data for areas that are surrounding and adjacent to Camp Pendleton and enter it into a GIS database. 2002. [Also applies to Section 4.1.2, second objective.]
- Develop a GIS based vegetation age class distribution map of the Base that shows levels of fuel loading. 2002. [Also applies to Section 4.11.1.]
- Conduct high-resolution ortho-rectified photography of the entire Base every five years. 2003.
- Assess the feasibility and desirability of conducting off-Base surveys of selected species and habitat types, water quality monitoring, and hydrographical surveys to contribute to the understanding of Camp Pendleton's regional contribution to species and habitat conservation and recovery. 2003. [Also applies to Sections 4.1.2, second objective; 4.2.2, first and second objectives; 4.5.2, first and second objectives.]

- Conduct high-resolution aerial photography of upland habitats on Camp Pendleton at the frequency required under the Upland Biological Opinion. TBD.

Other Planned Actions:

- Update basewide vegetation mapping of Camp Pendleton every four to five years. As needed, perform minor updates. ***
- Initiate floodplain delineations and watershed analyses basewide. Through appropriate hydrographic modeling, determine the various flood event levels for selected areas on Base. [Also applies to Section 4.3.1, second objective.] *
- Establish a digital and georeferenced photographic archive in GIS of each vernal pool group to help monitor changes over time. [Also applies to Section 4.2.3.] *
- Coordinate the acquisition of aerial photographs of watersheds. *

4.2.2 Species Specific Surveys/Monitoring

Species surveys help reveal the abundance and distribution of plant and animal populations on Camp Pendleton. Monitoring is essential for tracking and analyzing changes in population parameters (e.g., size, density, and distribution) and habitat type and quality over time. The Base conducts surveys and monitoring for selected species for a variety of reasons. A high priority for natural resources management is the monitoring of federally listed threatened and endangered species on Base to ensure compliance with regulatory requirements and to assist in the recovery efforts for those species (Section 4.5.2). Selected candidate, rare, sensitive (e.g., state listed species, migratory birds), and other (e.g., game and exotic) species may also be surveyed or monitored. Monitoring on species specific levels will help prepare the Base for potential future listings, assist with the management of consumptive recreational programs, evaluate the efficacy of management techniques, and provide additional indices of ecosystem health.

OBJECTIVE: Develop and maintain an inventory of *federally listed threatened and endangered species* on Camp Pendleton (e.g., distributions, occurrences, breeding success, predation rates, incidental take, etc.), using high quality and up-to-date GIS maps where appropriate and desirable.

Priority Planned Actions:

- Ensure that all federally listed threatened and endangered species known to occur on Base are monitored in accordance with USFWS Biological Opinions. Ongoing. (See Threatened and Endangered Species Management, Priority Planned Actions.) [Compliance requirement of Riparian/Uplands BO]

- Incorporate project specific survey data for federally listed species into the GIS species distribution database. Ongoing. [Also applies to Section 4.5.2, first objective.]
- Use the Environmental Incident Reporting System to collect, maintain, and report information about environmental incidents that occur on Camp Pendleton. Ongoing. [Also applies to Section 4.2.3.] [Compliance requirement of Riparian BO (T&C, p. 32; T&C, Appx 4, p. 2)]
- Survey for the quino checkerspot butterfly as required by survey protocol. Ongoing.
- Continue to implement the monitoring program that tracks compliance with the levels of take, and the measures and terms and conditions of the Incidental Take Section of the Riparian BO. Ongoing. [Compliance requirement of Riparian BO (T&C, p. 37; T&C, Appx 4, p. 2)]
- Establish an Incidental Take Database that will catalog incidental takes on MCAS. 2002. [Compliance requirement of Riparian BO (T&C, p. 37; T&C, Appx 4, p. 2)]
- Assess the feasibility and desirability of conducting off-Base surveys of selected species and habitat types, water quality monitoring, and hydrographical surveys to contribute to the understanding of Camp Pendleton's regional contribution to species and habitat conservation and recovery. 2003. [Also applies to Sections 4.1.2, second objective; 4.2.1, first objective; 4.2.2, second objective; 4.5.2, first and second objectives.]
- Collect survey data on isolated ephemeral wetland invertebrates, including the endangered San Diego fairy shrimp and the Riverside fairy shrimp at levels and intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD. [Also applies to Sections 4.2.2, second and third objectives; 4.5.2 first and second objectives.]
- Survey for the southern steelhead as determined in consultation with National Marine Fisheries Service and coordinate efforts and activities with CDFG. As needed, conduct genetic tests on a representative sample. TBD. [Also applies to Section 4.5.2, first objective.]

Other Planned Actions:

- Facilitate annual light-footed clapper rail surveys on Base. [Also applies to Section 4.5.2, first objective.] [Compliance requirement of Riparian BO (Appx 1, p. 83)] ***
- Survey for California red-legged frog. **

OBJECTIVE: Develop and maintain an inventory of selected *candidate, rare, and sensitive species* on Camp Pendleton. (e.g., distributions, occurrences, breeding success, predation rates, incidental take, etc.), using high quality and up-to-date GIS maps where appropriate and desirable.

Priority Planned Actions:

- Develop a standardized, regionally coordinated system for recording and mapping significant resource observations (plants, wildlife, erosion, damage, etc.). 2002. [Also applies to Section 4.2.2, third objective.]
- Develop a monitoring program for wildlife species of regional concern with a specific focus on those species likely to become proposed for listing as threatened or endangered in the near future. 2002. [Also applies to Sections 4.4.2, second objective; 4.5.2, second objective.]
- Assess the feasibility and desirability of conducting off-Base surveys of selected species and habitat types, water quality monitoring, and hydrographical surveys to contribute to the understanding of Camp Pendleton's regional contribution to species and habitat conservation and recovery. 2003. [Also applies to Sections 4.1.2, second objective; 4.2.1, first objective; 4.2.2, first objective; 4.5.2, first and second objectives.]
- Collect survey data on isolated ephemeral wetland invertebrates, including the endangered San Diego fairy shrimp and the Riverside fairy shrimp at levels and intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD. [Also applies to Sections 4.2.2, first and third objectives; 4.5.2 first and second objectives.]

Other Planned Actions:

- Develop an inventory program for wildlife species of regional concern with a specific focus on those species on the Base likely to become proposed for federal listing as threatened or endangered in the near future. [Also applies to Section 4.5.2, second objective.] ***
- Survey for rare plant species to facilitate management planning. ***
- Survey for species on Base that have been proposed for ESA listing by the USFWS. [Also applies to Section 4.5.2, second objective.] ***
- Continue to evaluate the status of raptor populations and reproduction on Camp Pendleton. [Also applies to Sections 4.2.2, third objective; 4.4.2, second objective.] **

- Establish a wildlife population trend monitoring program for existing native sensitive and nongame fish and wildlife species as a component of long term ecological trend monitoring. [Also applies to Sections 4.2.2, third objective; 4.4.1.] **

OBJECTIVE: Develop and maintain an inventory of *other* species on Camp Pendleton (e.g., distributions, occurrences, breeding success, predation rates, incidental take, etc.), using high quality and up-to-date GIS databases where appropriate and desirable.

Priority Planned Actions:

- Sponsor/support scientific research in support of regional understanding and Base management goals by qualified personnel. Ongoing. [Also applies to Sections 4.1.2, second objective; 4.4.2, second objective.]
- Participate in Annual Christmas Bird Count on MCAS to compile data on what birds are winter residents on MCAS. Ongoing. [Also applies to Section 4.4.2, second objective.]
- Conduct Spring Bird Count on MCAS to provide a comprehensive record on the numbers of birds at the Station during the spring. Ongoing. [Also applies to Section 4.4.2, second objective.]
- Continue exotic plant site identification, monitoring, and control efforts in upland habitats to ensure a low reintroduction rate. Ongoing. [Also applies to Section 4.6.1.]
- Map the spread of exotic plants and successful removal by control programs, including regional data when possible. Ongoing. [Also applies to Sections 4.2.3; 4.6.1; 4.8.] [Compliance requirement of Riparian BO (T&C, p. 35; Appx 4- tracking community distribution/value, habitat status)]
- Annually conduct and track (inventory) animal damage control, predator management, and cowbird control activities on Base. Ongoing. [Also applies to Sections 4.4.2, first objective; 4.4.3, first objective; 4.6.2.] [Compliance requirement of Riparian BO (Appx 4, p. 2)]
- Develop a standardized, regionally coordinated system for recording and mapping significant resource observations (plants, wildlife, erosion, damage, etc.). 2002. [Also applies to Section 4.2.2, second objective.]
- Obtain Audubon Society bird data collected on Camp Pendleton. 2003. [Also applies to Section 4.4.2, second objective.]

- Incorporate U.S. Geological Survey and CDFG fish survey data into GIS species distribution database. 2003. [Also applies to Section 4.5.2, first objective.]
- Collect survey data on isolated ephemeral wetland invertebrates, other than candidate, rare and threatened and the endangered San Diego fairy shrimp and the Riverside fairy shrimp at levels and intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD. [Also applies to Sections 4.2.2, first and second objectives; 4.5.2 first and second objectives.]

Other Planned Actions:

- Document occurrences of key exotic animals (e.g., species with potential to impact listed species) observed during survey efforts or that are incidentally encountered; use this information to schedule and prioritize exotic management actions. [Also applies to Section 4.3.1, first objective.] ***
- Continue to evaluate the status of raptor populations and reproduction on Camp Pendleton. [Also applies to Sections 4.2.2, second objective; 4.4.2, second objective.] **
- Establish a wildlife population trend monitoring program for existing native sensitive and nongame fish and wildlife species as a component of long term ecological trend monitoring. [Also applies to Sections 4.2.2, second objective; 4.4.1.] **

4.2.3 Long Term Trend Monitoring and Analysis

The long term monitoring and analysis of natural resources is essential for tracking ecosystem processes and trends and for adapting management initiatives to best suit Base resources and the military mission. The shift in focus from single species monitoring discussed in the previous section, to monitoring sites with multiple species and the inclusion of abiotic and anthropogenic factors would allow for a broader evaluation of ecological processes and potential causal relationships. Included in this section are initiatives such as the Base's Long Term Ecological Trend Monitoring (LTETM) project, the monitoring of abiotic factors (e.g., erosion, fire, and water quality), and the monitoring of anthropogenic impacts, including the Camp Pendleton Alternative Futures Study. Several of the trend monitoring actions included in this section are also components of other management programs on Base as well (e.g., erosion control and fire management).

The LTETM project is a continuation of and modification to the Land Condition Trend Analysis project that was initiated in 1990. LTETM serves as an annual data gathering tool to monitor ecosystem changes, the potential impacts of land use, and the efficacy of natural resource management practices. The LTETM project consists of nearly two hundred 100-m-long line transect permanent sample sites ("core" plots) and "special use" plots that are established as needed. To date, 38 special use plots have been established to monitor fire, erosion, restoration efforts, the effects of military training on Vasey's button celery

(*Eryngium vaseyi*), population dynamics of thread-leaved brodiaea (*Brodiaea filifolia*) and many-stemmed hasseanthus (*Dudleya multicaulis*), and population dynamics and fire ecology of Englemann oak (*Quercus englemanii*) woodlands.

To support erosion control efforts (see General Vegetation Management and Soil Conservation, Section 4.7.2), the Base began identifying and monitoring locations of erosion problems basewide in the late 1980s (Kellogg & Kellogg 1988). In 1997, a database of erosion sites (Soil Erosion Field Inventory) was developed to assist the Base in prioritizing its limited resources to better focus on areas where success was readily achievable.

Effective mapping and consistent knowledge of fire location, frequency, size, and pattern is necessary for long term trend analyses and proactively managing fire (see Section 4.11). Gaps in the fire records and inconsistent and sometimes inaccurate mapping of fires have made management difficult for the Base in the past. A fire history for Camp Pendleton, which was built from a combination of available records and remote sensing interpretation, was compiled as part of the update of the fire management plan in 1998. Since 1997, the Base has mapped the boundaries of all wildland fires greater than five acres in size outside of the impact areas (excluding prescribed burns). The intensity of burning within a fire perimeter had never been well documented on the Base. Yet, burning intensity can have enormous implications on the amount of vegetation removal and subsequent recovery rates for vegetation and habitat values. Development of a practical method for mapping burning intensities was finalized for the 1999 fire season.

The Camp Pendleton “Alternative Futures Study” (*Biodiversity and Landscape Planning: Alternative Futures for the Region of Camp Pendleton, California* [Steinitz 1996]) was conducted during 1995 by the Biodiversity Research Consortium, a team of investigators from the Harvard University Graduate School of Design, Utah State University, the National Biological Service, the U.S. Forest Service, The Nature Conservancy, and Marine Corps Base Camp Pendleton, with the cooperation of the two relevant regional planning agencies, the San Diego Association of Governments and Southern California Association of Governments. This study examined how urban growth and change in a 50-by-80-mile region situated between San Diego and Los Angeles (surrounding Camp Pendleton) might influence, or be influenced by, the region’s existing biodiversity. This research study was funded by the Strategic Environmental Research and Development Program (SERDP), a joint program of the U.S. Department of Defense, the U.S. Department of Energy, and the U.S. Environmental Protection Agency, through a grant to the Western Ecology Division of the EPA’s National Health and Environmental Effects Research Laboratory, and the U.S. Department of Agriculture Forest Service Pacific Northwest Research Station.

The purpose of the study effort and subsequent publication was educational, principally to provide information regarding issues, strategic planning options, and possible consequences related to regional development and associated impacts to biodiversity to the many stakeholders and jurisdictions in the region. As a follow-on to the study results, Camp Pendleton provided to both the DoD, SERDP, and EPA sponsors a “lessons learned” assessment from the original effort and provided further direction on how to undertake an expanded version of the study within the entire County of San Diego, including all military bases in the region.

As a result of the Alternative Futures Study, Camp Pendleton has realized direct benefit through the assurance that regional land use maps in the future include the “military” as an official land use category. Up to that point, local jurisdictions and regional planning agencies had assigned all military lands in the region as “unused.” Further, tenets of the study are being used in planning biodiversity preserves off-Base to protect critical nodes which will support linkage to the Base’s resources, supporting the most viable matrix of biologically diverse elements in the region. Camp Pendleton, in cooperation with the USFWS as the regional ecosystem manager, continues to use the Alternative Futures Study to influence off-Base regional planning efforts to help achieve species recovery plans and goals.

During 2000, Camp Pendleton initiated a follow on study to review and evaluate the Alternative Futures Study (Steinitz 1996). Existing conditions will be used to validate the results of the predictive models and to refine the regional biodiversity picture, including development of additional alternative futures projections in light of changes in growth and preserve patterns and current conservation planning in San Diego, Orange, and Riverside Counties. Further, the scope of study has been expanded to include: (1) MCAS Miramar and coastal San Diego County down to the San Diego River, (2) an evaluation of the sufficiency of regional habitat conservation plans to achieve conservation goals and biodiversity requirements within the parameters of alternative futures, (3) assessment of the recovery potential of select threatened and endangered species within the context of the alternative futures scenarios, and (4) an assessment of Camp Pendleton’s and MCAS Miramar’s role and contributions to regional biodiversity in view of the alternative futures scenarios. The results of this study will provide the Marine Corps and regional planners with an enhanced ability to understand and project the expected impacts of alternative futures scenarios on their ability to manage both land use and biodiversity. This study is expected to be completed in the fall of 2002 and will be made available to regional planners and interested parties.

OBJECTIVE: Monitor and analyze long term ecological, abiotic, and anthropogenic trends that will contribute to the understanding of ecosystem processes and to the ability to adaptively manage for a sustainable system.

Priority Planned Actions:

- Map the spread of exotic plants and successful removal by control programs, including regional data when possible. Ongoing. [Also applies to Sections 4.2.2, third objective; 4.6.1; 4.8.] [Compliance requirement of Riparian BO (T&C, p. 35; Appx 4)]
- Develop GIS layers of comparable datasets that allow for spatial and temporal change detection in populations of selected species and sensitive habitat types. Ongoing. [Also applies to Section 4.4.2, second objective.]

- Update the GIS database with wildland fire data annually. Map all wildland fires outside of impact areas that are greater than five acres and identify impacts to threatened and endangered species. Ongoing. [Also applies to Section 4.11.3.]
- Continue to monitor tide levels and water quality in the Santa Margarita River; evaluate potential changes to the estuarine ecosystem as a result of ongoing watershed actions and projects and document the periods when the other coastal lagoons are subject to tidal influence. Ongoing. [Also applies to Sections 4.3.3; 4.7.1, sixth objective.] [Compliance requirement of Riparian BO (T&C, Appx 4, p. 2)]
- Continue groundwater monitoring in all drainages where groundwater is extracted to determine and manage the potential effect on listed species habitat. Ongoing. [Also applies to Section 4.7.1, sixth objective.] [Compliance requirement of Riparian BO (T&C, Appx 4, p.1)]
- Monitor stream water quality, flood regimes, and storm event frequency. Ongoing. [Also applies to Section 4.7.1, sixth objective.] [Compliance requirement of Riparian BO (T&C, Appx 4, p.1)]
- Use the Environmental Incident Reporting System to collect, maintain, and report information about environmental incidents that occur on Camp Pendleton. Ongoing. [Also applies to Section 4.2.2, first objective.] [Compliance requirement of Riparian BO (T&C, p. 32; T&C, Appx 4, p. 2)]
- Establish monitoring plots to track natural resource recovery after wildland fire impacts. 2002. [Also applies to Section 4.11.3.]
- Develop and implement a Photo Transects Program to document and track changes in targeted areas on MCAS. 2002.
- Develop and begin implementation of a long term ecological monitoring program on MCAS. 2002.
- Evaluate the feasibility of adding portions of tracking systems (Range Facility Management Support System, E-Trax, etc.) that records the level of ongoing programmatic activities and documents trends in the frequency, magnitude, and extent of these activities to Natural Resources GIS layers. 2004.

Other Planned Actions:

- Monitor the effects of off road vehicle use and provide for the rehabilitation of training lands that have excessive degradation. [Also applies to Section 4.7.2, first objective.] **
- Conduct annual monitoring of Long Term Ecological Trend Monitoring plots. **

- Establish a digital and georeferenced photographic archive in GIS of each vernal pool group to help monitor changes over time. [Also applies to Section 4.2.1.] *
- Digitize, with high-resolution scanning, the historical and ongoing aerial photos of the Base and provide archival storage protection for the original prints. [Also applies to Section 4.14.2, first objective.] *

4.3 WETLANDS, ESTUARY/COASTAL, AND RIPARIAN MANAGEMENT

This section addresses the management of wetlands, estuary/coastal, and riparian areas on Camp Pendleton. Although wetlands include a wide range of habitat types, including swamps, marshes, and bogs, wetlands on Base are primarily riparian systems, estuaries, isolated ephemeral wetlands, and vernal pools. Descriptive statistics for wetlands, estuary/coastal, and riparian areas on Base are presented in Chapter 3. Management and use of these areas requires careful consideration of the CWA, ESA, and EO 11990 to prevent an overall net loss of wetlands, and their associated functions and values. Legislation and regulations relevant to wetlands, estuary/coastal, and riparian management are summarized in Appendix B.

Specific goals and commitments for quantities and quality of wetlands, estuary/coastal, and riparian habitats and populations of specific species in these areas have been established (in consultation with the USFWS) in the Estuarine and Beach Ecosystem Conservation Plan (Appendix D) and the Riparian Ecosystem Conservation Plan (Appendix E).

Camp Pendleton's Riparian and Estuarine/Beach Conservation Plans are habitat based. Their management strategy focuses on increasing habitat quality by eradicating exotic vegetation and encouraging growth of native vegetation, which, in turn, has been shown to support a greater number of listed species. In so doing, these conservation plans are also expected to support future federally listed threatened and endangered species and other species that utilize these habitats on Base.

These conservation programs take an adaptive management approach. Over time, many factors upon which these programs are based are likely to change, including military mission requirements, the federal list of threatened and endangered species, knowledge of the ecology and requirements of the listed species, as well as an understanding of the nature of anthropogenic impacts to those species. Some changes are foreseeable; others are not. In the face of uncertainty, the most prudent strategy is to recognize the possibility of surprise, act to detect it, and correct avoidable error.

The general management approach of these conservation plans can be characterized as the "managing of impacts." As such, they are divided into two components, one for the management of impacts that are *temporary* (e.g., from ongoing activities such as training, maintenance, and recreation) and one for those that are *permanent* (e.g., from infrastructure development projects).

For the management of temporary impacts from ongoing activities a suite of basewide management programs that directly and/or indirectly benefit listed species has been established to compensate for the temporary impacts that do occur. The goal of these compensation measures is to improve habitat value over time, thereby supporting larger populations of listed species.

For activities that would result in a permanent impact (often referred to as “projects”), the Base has established the following management strategy:

- A minimum habitat acreage guarantee has been established to prevent long-term accumulation of permanent impacts basewide. This regional commitment will help to support the current inventory of species and complement landscape linkages in the region.
- A Consultation Class System has been established to determine the level of communication/consultation required between the Service and the Base for projects/permanent impacts.
- Programmatic instructions for new projects were established to help avoid and minimize impacts to listed species and managed habitat during project design and construction.
- Appropriate type and amount of mitigation necessary for future projects was established in advance through consultation with the USFWS.

GOAL: Incorporate principles of ecosystem management into wetlands and coastal management to conserve and enhance native fauna and flora and the functional value of natural systems.

GOAL: Manage wetlands and coastal areas so they remain available and suitable for amphibious, land, and air based training.

GOAL: Monitor, conduct investigative research, and analyze data in order to make informed decisions necessary for maintaining training lands.

4.3.1 General Wetlands, Estuary/Coastal, and Riparian Management

Wetlands are highly productive, complex ecosystems. Wetland management is a challenge nationally and more so in California, which has lost a greater proportion of its original wetlands than any other state. General wetlands management actions are taken to ensure that all facilities and operational actions avoid, to the maximum degree feasible, wetlands destruction or degradation regardless of wetland size or legal necessity for a permit. Any facility requirement that cannot be sited to avoid wetlands must be designed to minimize wetlands degradation and must include compensatory mitigation as required by wetland regulatory agencies in all phases of project planning, programming, and budgeting. Within

this policy, use of Marine Corps lands and lands of other entities are permissible for mitigation purposes for Marine Corps projects when consistent with EPA and Army Corps of Engineers (ACOE) guidelines or permit provisions.

OBJECTIVE: Manage wetlands on Camp Pendleton to ensure no net loss of wetland functions and values.

Priority Planned Actions:

- Comply with Section 404 Clean Water Act permits issued by the ACOE to (1) ensure compliance with permits issued for DoD actions on the Base; and (2) to monitor the execution of special conditions of permits issued to non-DoD agency proposed actions. Ongoing.
- Continue to develop a GIS wetlands mapping coverage for Camp Pendleton that supports proactive planning and impact avoidance. Ongoing. [Also applies to Sections 4.2.1; 4.3.2.]
- Track plant community distribution, habitat function and value, and vegetation age classes. Ongoing. [Also applies to Sections 4.2.1; 4.3.4.] [Compliance requirement of Riparian BO (T&C, Appx 4, p.1)]
- Evaluate the feasibility of participating in cooperative watershed restoration programs, including cooperating with local governmental and nongovernmental stakeholders. Ongoing. [Also applies to Sections 4.1.2, second objective; 4.5.4; 4.7.1, first objective.]
- Conduct high-resolution aerial photography of the riparian and estuarine areas on Camp Pendleton every two years. 2002, 2004, 2006. [Also applies to Sections 4.2.1, 4.3.4.] [Compliance requirement of Riparian BO (Recom p. 39; T&C, Appx 4, p. 1; T&C, Appx 5, p. 4)]
- Continue until 2003 the study of the effects of the absence of effluent release into the Santa Margarita River. 2002, 2003.
- Ensure that all natural resource staff and/or contractors responsible for wetland conservation have obtained wetlands regulatory, policy, and formal delineation training and that at least one staff member has received this training at all times. 2002.
- Develop an assessment of, and apply for, a programmatic general permit for maintenance of diversion facilities, road crossings, culverts, and bridges through wetlands and flood prevention actions. 2004.

Other Planned Actions:

- Document occurrences of key exotic animals (e.g., species with potential to impact listed species) observed during survey efforts or that are incidentally encountered; use this information to schedule and prioritize exotic management actions. [Also applies to Section 4.2.2, third objective.] ***
- Identify candidate sites for future wetland mitigation to compensate for unavoidable wetland value losses (and include in future master planning documents). [Also applies to Section 4.12.3.] ***
- Enter into agreements to implement a Santa Margarita River watershed wetlands management program, which includes Base credits or banking for beneficial actions upstream of the Base. ***
- Enter into agreements to credit the Base for wetlands creation or enhancement in connection with Permit 15,000 development or Base participation in or cooperation with the Murrieta Creek Flood Control Project. *

OBJECTIVE: Manage floodplains on Camp Pendleton to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

Priority Planned Actions:

- During project and NEPA review, ensure that direct or indirect adverse impacts to federally listed species, critical habitat, floodplains, wetlands, and other sensitive resources are identified and avoided or minimized when possible. Ongoing. [Also applies to Section 4.12.1, first objective.]

Other Planned Action:

- Initiate floodplain delineations and watershed analyses basewide. Through appropriate hydrographic modeling, determine the various flood event levels for selected areas on Base. [Also applies to Section 4.2.1.] *

4.3.2 Isolated Ephemeral Wetlands/Vernal Pool Management

A number of areas at Camp Pendleton contain a wetland habitat known as isolated ephemeral wetlands. These isolated ephemeral wetlands occur naturally on hummocky soils with impervious subsurface layers, in swales between “mima mounds,” or in other depressions that impound water. Water ponds in these depressions in the winter and spring, and dries

later in the year. Specialized plant and animal species adapted to the seasonal wet and dry cycle thrive in many isolated ephemeral wetlands, including a number of sensitive plant and wildlife species, four of which are federally listed: spreading navarretia (*Navarretia fossalis*), San Diego button-celery (*Eryngium aristulatum* var. *parishii*), Riverside fairy shrimp (*Streptocephalus woottoni*), and San Diego fairy Shrimp (*Branchinecta sandiegoensis*). Vernal pools are a type of isolated ephemeral wetlands and are differentiated from other isolated ephemeral wetlands by their assemblage of floral species.

Currently, Camp Pendleton has completed two basewide inventories of isolated ephemeral wetlands (including vernal pools) and is in consultation with the USFWS for the management of the four listed species that are associated with vernal pools (in the Uplands Biological Assessment).

Management initiatives proposed within the Biological Assessment of Upland Habitats (currently under consultation with the USFWS) focus on the listed species and occupied pools. However, isolated ephemeral wetlands and vernal pools in general (including unoccupied pools) are expected to benefit from the proposed management for minimizing or avoiding the potential impacts from programmatic activities on Base. The Biological Assessment of Upland Habitats has a proposed system of “management levels” that addresses the impacts from training and related activities. Training areas on Base are either designated as Management Level 1 or Management Level 2. Training is permissible in both Management Levels; however, Management Level 2 areas have enhanced programmatic instructions intended to provide a higher level of avoidance and minimization of environmental impacts by personnel training on the Base.

Fifty percent of all known locations of pools (including isolated ephemeral wetlands and vernal pools) occur within the more protective Management Level 2 areas on Base. Moreover, according to the habitat quality classification system developed within the Isolated Ephemeral Wetlands Management Plan, the pools proposed for inclusion within Management Level 2 areas tend to be all of higher quality than the pools within Management Level 1 areas. Habitat quality for the classification system was assessed in terms of level of disturbance, soil profiles, and plant species diversity. The pool class scale ranges between 1 (high quality habitat) and 4 (low quality habitat). All Class 1 pools and 85% of Class 2 pools on Base are proposed for inclusion in the more protected Management Level 2 areas. Of the Class 3 and Class 4 pools, 46% and 42% respectively, are proposed for inclusion in Management Level 2 areas.

Wetlands in general and all pools occupied with listed species (in both Management Levels) receive protection from nontraining activities on Base through the use of programmatic instructions to avoid and minimize adverse impacts. A permanent project impact to occupied pools or jurisdictional wetlands requires mitigation. Projects that have the potential to impact vernal pools are evaluated on a watershed scale. As proposed within the Biological Assessment of Upland Habitats, Camp Pendleton is committed to maintaining free from permanent impact a percentage of the pools currently occupied by listed species as a commitment and contribution to regional recovery efforts. This regional commitment includes 25% of the pools currently occupied with San Diego fairy shrimp, 70% of the pools

with Riverside fairy shrimp, 75% of the pools with the San Diego button celery, and 78% of the pools with spreading navarretia.

OBJECTIVE: Protect the natural and beneficial functions of the Camp Pendleton's isolated ephemeral wetlands, including vernal pools. Take proactive action to prevent damage to vernal pools.

Priority Planned Actions:

- Maintain high quality and up-to-date GIS mapping of vernal pools on Camp Pendleton that support proactive planning and avoidance of impact. Ongoing. [Also applies to Section 4.2.1.]
- Continue to develop a GIS wetlands mapping coverage for Camp Pendleton that supports proactive planning and impact avoidance. Ongoing. [Also applies to Sections 4.2.1; 4.3.1, first objective.]
- Use various media to create and maintain awareness of Base personnel, general public, and lease and easement holders of the sensitivity, values, and obligations regarding the conservation of vernal pools and their watersheds. This includes presentations, briefs, newspaper articles, special messages, informational brochures, and interpretive signs. Ongoing. [Also applies to Section 4.5.1.]
- Place new field markers, signs, or fencing around vernal pool groups with a high susceptibility for damage to prevent accidental and/or unintentional damage. Ongoing.
- Work continuously with project and activity planners to avoid or minimize impacts to vernal pools early in the planning process. Ongoing.
- Replace deteriorated field markers, signs, or fencing around vernal pool groups with a higher susceptibility for damage to prevent accidental and/or unintentional damage every other year. 2002, 2004.
- Ensure that the Range and Training Regulations (Base Order P3500.1_), when revised, contain information and programmatic instructions to minimize damage to vernal pools by units training on the Base. 2003, 2005.
- Upon receipt from the USFWS, develop and implement the commitments and required elements contained within the Upland Biological Opinion. TBD. [Also applies to Section 4.5.1.]

Other Planned Actions:

- Design and develop a permanent vernal pool public education and interpretive display for public education on Base. ***
- Identify potential impacts that lessee and right-of-way holder activities could have to vernal pools and other resources. **
- Map other isolated ephemeral wetlands, and fully map watersheds of vernal pools and isolated ephemeral wetlands. *

4.3.3 Estuary/Coastal Zone Management

The management of estuary/coastal zone areas on Base is presented in the Estuarine/Beach Ecosystem Conservation Plan (Appendix D) and the Riparian BO (USFWS 1995a). The Estuarine/Beach Ecosystem Conservation program is designed to sustain and enhance estuarine and beach ecosystem dynamics to ensure that estuarine and beach communities on Camp Pendleton are sufficiently resilient to withstand natural and human disturbances including military training activities. This includes (1) conservation of listed species and their associated habitats and (2) maintaining and enhancing the functionality and biodiversity of the Santa Margarita River Estuary and the coastal lagoons located at Cockleburrr, French, Hidden, Aliso, Las Flores, San Onofre, and San Mateo Creeks. Conservation efforts are being accomplished through active management efforts (e.g., protective fencing, warning signs, predator management, exotic vegetation control, monitoring of estuary salinity and tidal conditions) and through application of the programmatic instructions to facilitate avoidance and minimization of impacts within the land areas designated as management zones. Funding for future enhancement activities listed under the conservation recommendations, terms and conditions, and reasonable and prudent measures of the Riparian BO (USFWS 1995a) are being actively pursued to promote recovery of the appropriate species. Management proscriptions emphasize avoiding locating projects in estuary and beach areas to avoid permanent impacts from construction.

Base operations, activities, projects, and programs that affect the land, water, or natural resources of any coastal zone must be consistent, to the maximum extent practicable, with the policies of California's coastal zone management program. The Base supports the development and implementation of state coastal nonpoint pollution control programs on Marine Corps lands by identifying nonpoint sources, specifying corrective measures, and coordinating nonpoint source compliance efforts with state programs (HQMC 1998). Camp Pendleton has identified areas of sensitive natural resources of the coastal zone, minimized the loss or degradation of coastal wetlands, enhanced the natural value of wetlands, and protected water quality.

The effectiveness of Camp Pendleton's estuary/coastal zone management program will be determined through periodic measuring and monitoring of species population, habitat quantity and habitat values and comparing those values against goals and commitments

established (in consultation with the USFWS) in the Estuarine and Beach Ecosystem Conservation Plan (Appendix D).

An important component of estuary/coastal zone management is the issue sea cliff, canyon, and coastal terrace erosion. A study by Khun (1999) that addresses this subject is discussed within Section 4.7.2.

OBJECTIVE: Protect and rehabilitate the natural and beneficial functions of the Base's estuaries and coastal zones. Continue to implement the Estuarine/Beach Ecosystem Conservation Plan, as specified in the Riparian BO issued by the USFWS (1995a).

Priority Planned Actions:

- Continue to monitor tide levels and water quality in the Santa Margarita River; evaluate potential changes to the estuarine ecosystem as a result of ongoing watershed actions and projects and document the periods when the other coastal lagoons are subject to tidal influence. Ongoing. [Also applies to Sections 4.2.3; 4.7.1, sixth objective.] [Compliance requirement of Riparian BO (T&C, Appx 4, p. 2)]
- Monitor the effects of sedimentation in the Santa Margarita River Estuary and coastal lagoons that are subject to upstream disturbance from programmatic, construction activities, and off Base activities. Ongoing. [Also applies to Sections 4.7.1, sixth objective; 4.7.2, first objective.] [Compliance requirement of Riparian BO (Appx 4, p.2)]
- Continue to implement programmatic instructions for activities in and adjacent to riparian and estuarine/beach habitats. Ongoing. [Also applies to Section 4.3.4.] [Compliance requirement of Riparian BO (Reason & Prud meas, p. 31-32; Appx 5 in general)]
- Obtain concurrence from the USFWS that impacts are adequately offset by the Riparian and Estuarine/Beach Ecosystem Conservation Plans for any activity not specifically addressed in the programmatic instructions of the plan or otherwise covered in the Riparian BO. Ongoing. [Also applies to Section 4.3.4.] [Compliance requirement of Riparian BO (T&Cs 1b & 2b, pp. 33-34)]
- Rehabilitate estuarine/beach areas temporarily disturbed due to nonroutine maintenance and construction activities to original or better condition. Ongoing. [Compliance requirement of Riparian BO (T&C, p. 33; Appx 5, p. 3)]
- Ensure all beach managers and lifeguards receive training with regard to the implementation and enforcement of environmental laws and regulations. Ongoing. [Also applies to Section 5.3.2.]
- Develop a habitat enhancement plan for the San Onofre estuary. 2003.

Other Planned Actions:

- Restore and enhance coastal dunes. [Also applies to Section 4.7.2, first and second objectives.] ***
- Develop specific habitat enhancement plans for estuaries other than the San Onofre estuary. ***
- Monitor sediment load and model sediment transport in the Santa Margarita River mainstem and the estuary. ***
- Reduce encroaching bluff erosion. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval. [Also applies to Section 4.7.2, first and second objectives.] **
- Evaluate the level of unauthorized recreational usage of the beach and the potential impacts. If needed, develop possible solutions. [Also applies to Section 5.3.2.] *
- Limit expansion of waterfront activities at all MCCA beaches and focus efforts towards improving existing programs and facilities. [Also applies to Section 5.3.2.] *
- Develop a master plan for recreational and other land uses of San Onofre Beach. [Also applies to Section 5.3.2.] *

4.3.4 Riparian Habitat Management

Riparian habitat management is accomplished through implementation of the Riparian Ecosystem Conservation Plan (Appendix E) and the Riparian BO (USFWS 1995a). The Riparian Ecosystem Conservation Plan is designed to maintain and enhance the biological diversity of the riparian ecosystem on Camp Pendleton. The conceptual approach behind this conservation plan is to sustain and restore riparian ecosystem dynamics so that natural plant and animal communities on the Base are sufficiently resilient to coexist with current and future military training activities. The success of this plan is primarily measured by the species richness and an increase in ecosystem health and value.

The plan identifies the major riparian habitats and quantifies the baseline (as present in 1994) acreage for each. The plan also assigns values to habitat types based on their suitability for current threatened and endangered species. These values were qualitatively developed based on information related to the distribution and abundance of threatened and endangered species and what was then known about their life history requirements. The riparian plan is a commitment to promote an increase in the quantity of riparian woodland and riparian scrub habitat throughout all the Base's watersheds, beyond the baseline established in the Santa Margarita River Memorandum of Understanding. Further, it promotes the maintenance of the open water/gravel areas and marsh areas within the baseline. Conservation efforts are

focused on the eradication of exotics for various habitat categories and conversion of this acreage to riparian woodland riparian scrub or open gravel areas in pursuit of the goal of promoting growth in threatened and endangered species (primarily least Bell's vireo [*Vireo bellii pusillus*], southwestern willow flycatcher [*Empidonax traillii extimus*], and arroyo toad [*Bufo californicus*]) populations.

The effectiveness of Camp Pendleton's riparian habitat management will be determined through periodic measuring and monitoring of species population, habitat quantity and habitat values and comparing those values against goals and commitments established (in consultation with the USFWS) in the Riparian Ecosystem Conservation Plan (Appendix E).

OBJECTIVE: Continue to implement the Riparian Ecosystem Conservation Plan, as specified in the Riparian BO issued by the USFWS (1995a).

Priority Planned Actions:

- Continue to implement programmatic instructions for activities in and adjacent to riparian and estuarine/beach habitats. Ongoing. [Also applies to Section 4.3.3.] [Compliance requirement of Riparian BO (Reason & Prud meas, p. 31-32; Appx 5 in general)]
- Obtain concurrence from the USFWS that impacts are adequately offset by the Riparian and Estuarine/Beach Ecosystem Conservation Plans for any activity not specifically addressed in the programmatic instructions of the plan or otherwise covered in the Riparian BO. Ongoing. [Also applies to Section 4.3.3.] [Compliance requirement of Riparian BO (T&Cs 1b & 2b, pp. 33-34)]
- Develop and implement mitigation measures for future proposed training and maintenance actions (that are not addressed in the Riparian BO) that may affect listed species or riparian habitat. Ongoing. [Compliance requirement of Riparian BO (T&C, p. 33)]
- Rehabilitate riparian areas temporarily disturbed due to nonroutine maintenance and construction activities to original or better condition. Ongoing. [Compliance requirement of Riparian BO (T&C, p. 33; Appx 5, p. 3)]
- Track plant community distribution, habitat function and value, and vegetation age classes. Ongoing. [Also applies to Sections 4.2.1; 4.3.1, first objective.] [Compliance requirement of Riparian BO (T&C, Appx 4, p.1)]
- Reduce or eradicate exotic vegetation from riparian areas and temporarily disturbed sites on Camp Pendleton in accordance with the Riparian Ecosystem Conservation Plan and the Riparian BO. Ongoing. [Also applies to Section 4.6.1.] [Compliance requirement of Riparian BO (T&C, p. 33; Appx 5, p. 3)]

- Conduct high-resolution aerial photography of the riparian and estuarine areas on Camp Pendleton every two years. 2002, 2004, 2006. [Also applies to Sections 4.2.1; 4.3.1, first objective.] [Compliance requirement of Riparian BO (Recom p. 39; T&C, Appx 4, p. 1; T&C, Appx 5, p. 4)]

Other Planned Action:

- Implement an effective dust control program to help minimize fugitive dust and sedimentation problems. [Compliance requirement of Riparian BO (T&C, Appx 5, pp. 2,3)] *

4.4 WILDLIFE MANAGEMENT

Fish and wildlife management is defined by the Marine Corps as "A coordinated program of actions designed to preserve, enhance, and regulate indigenous wildlife and its habitats, including the conservation of protected species and nongame species, management and harvest of game species, reduction in bird aircraft strike hazard (BASH), and animal damage control" (HQMC 1998). It is the Marine Corps policy that installations must comply with laws for the protection and management of wildlife resources and must develop, where compatible with military requirements, programs for the development, enhancement, and use of wildlife resources.

Topics included in this section are general wildlife management, migratory bird management, wildlife damage management (including BASH), integrated pest management, and game species and sport fisheries management. Pest management is included as it has potential effects on fish and wildlife, particularly with the application of pesticides. Federally listed species management and the exotics control program are addressed separately in following sections. Legislation and regulations relevant to fish and wildlife management are summarized in Appendix B.

GOAL: Incorporate ecosystem and adaptive management into management programs to conserve and enhance native fauna and the functional value of natural systems.

GOAL: To better understand natural processes and impacts, use monitoring, investigative research, and data analysis to make informed decisions necessary for maintaining training lands.

GOAL: Maintain viable populations of sensitive animal species and species that are indicators of important habitat or habitat health.

GOAL: Maintain functional wildlife corridors and habitat linkages between critical biological resource areas.

4.4.1 General Wildlife Management

All species of wildlife benefit from Camp Pendleton's basic strategy to maintain training areas in a natural state in support of training, reduce adverse impacts from activities, minimize development, and perform mitigation actions where impacts occur to threatened or endangered species, vernal pools, and other wetlands. The protection (via enhanced programmatic instructions) of riparian and estuarine/beach habitats and Management Level 2 areas (as proposed within the Biological Assessment of Upland Habitats) is ostensibly for federally listed species; however, numerous non listed, native species also benefit from these areas of reduced impacts. Indirectly, other proactive resource management initiatives, such as vegetation enhancement, will help protect the viability of wildlife populations on Camp Pendleton.

The basis of good management is understanding the diversity, abundance, distribution, population dynamics, and habitat requirements of species. While not feasible to survey and monitor all wildlife populations on Base, some species, such as federally listed species, help to provide indicators of ecosystem health in general. Moreover, the Base continues to conduct, or support others in conducting, studies that help managers to better understand the diversity and distribution of wildlife resources on Base. These studies have included monitoring neotropical migrant birds, arthropod surveys, lepidoptera surveys, bat surveys, herpetological surveys, and mule deer surveys.

OBJECTIVE: Manage existing native sensitive and nongame fish and wildlife species in order to support and maintain self-sustaining populations.

Priority Planned Actions:

- Provide focused training to the natural resources staff members responsible for wildlife management. Ongoing.
- Continue to study the effects of aircraft noise on passerines. Ongoing until 2006. [Also applies to Sections 4.4.2, second objective; 4.5.3.] [Compliance requirements of BRAC BO]
- In collaboration with Camp Pendleton land users, federal, state, tribal, local governments, nongovernmental organizations, private organizations, and the public, develop a shared vision of what constitutes desirable future ecosystem conditions. 2003. [Also applies to Sections 4.1.1, first objective; 4.1.2, first objective.]
- Identify controlled burn or other brush management areas that will be valuable for maintaining or enhancing mosaic and diversity of vegetative age classes and enhance wildlife diversity. This will compliment the Camp Pendleton Wildland Fire Management Plans and Uplands Ecosystem Conservation Plan. 2004. [Also applies to Section 4.11.1.]

Other Planned Action:

- Establish a wildlife population trend monitoring program for existing native sensitive and nongame fish and wildlife species as a component of long term ecological trend monitoring. [Also applies to Section 4.2.2, second and third objectives.] ***

4.4.2 Migratory Bird Management

Camp Pendleton provides habitats and open space for a wide variety of migratory birds that migrate annually within and beyond North America. Regardless of how birds use Camp Pendleton, their presence provides important ecological services and an important indicator of ecosystem health. Primary considerations with regard to migratory bird management are compliance with the Migratory Bird Treaty Act (MBTA); implantation of migratory bird management actions in accordance with EO 13186; and support, contribution, and compatibility with the goals and efforts of numerous regional migratory and game bird conservation programs.

The MBTA is an international agreement between the United States, Canada, and Mexico that protects designated species of birds. Virtually all birds that occupy Camp Pendleton throughout the year are protected under the act. The MBTA controls many actions that may negatively affect migratory birds, particularly collection and transport of birds. Special purpose permits may be requested and issued that allow for the relocation or transport of migratory birds for management purposes.

Executive Order 13186 was issued on 10 January 2001 and requires federal agencies taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement, within 2 years, a MOU with the USFWS. The Secretary of the Navy is developing the MOU that pertains to Navy and Marine Corps operations and installations. When completed, the protocols, guidance and responsibilities regarding protection of migratory birds developed in the MOU will be included in Camp Pendleton management programs and this INRMP.

Comprehensive bird conservation plans for nongame birds have recently been developed for landbirds, shorebirds, and colonial waterbirds. These plans identify species and habitat conservation priorities at the national and more detailed regional scale. The Pacific Flyway and North American Waterfowl Management Plans provide comparable conservation priorities, goals, and objectives for various waterfowl species and habitats within the Pacific Flyway. (USFWS Memo July 31, 2001).

Plans that encompass the west coast and southern California and have some level of applicability to Camp Pendleton include: USFWS Nongame Birds of Management Concern – The 1995 List; California Partners in Flight (CPIF) Draft Coastal Scrub and Chaparral Bird Conservation Plan; CPIF Oak Woodland Bird Conservation Plan; CPIF Riparian Bird Conservation Plan; CPIF Draft Grassland Bird Conservation Plan; The U.S. Shorebird Conservation Plan; The North American Waterbird Conservation Plan; and the Pacific

Flyway and North American Waterfowl Management Plans. While these regional conservation plans focus on various sets of migratory birds, and provide specific recommendations and goals for individual species, they have several goals, recommendations and objectives in common with each other and with Camp Pendleton's current and proposed natural resource management plans.

In addition to providing specific population goals and recommendations for individual species, the above plans identify several common conservation themes and objectives for the protection and conservation of migratory birds. Where these conservation plans establish priorities, goals, objectives and recommendations at the physiographic, regional, and national scale those priorities, goals, objectives and recommendations may be more appropriately addressed in the MOU being developed between the DoN and the USFWS (required by EO 13186) since they cover areas and issues that go beyond an individual installation. With regards to priorities, goals, objectives, and recommendations that support migratory birds at the local level Camp Pendleton has supported and continues to support projects that address migratory bird species, and the general ecosystem/habitat goals of these plans. Below are conservation objectives identified in the migratory bird conservation plans and a brief description of past and on going Base programs that contribute to these programs.

- Maintaining connectivity between habitat patches uses by migratory birds. Camp Pendleton's large contiguous area of open space provides few restrictions to migratory movement. The Base is currently following the development of regional conservation plans covering areas adjacent to Camp Pendleton to see how these plans establish preserves and corridor links to the Base and other habitats usable by migratory birds.
- Limiting disturbance events, such as prescribed burns, grazing, disking, and herbicide applications, to non-breeding seasons. Camp Pendleton's existing and proposed conservation plans limit activities that may disturb habitat during the breeding season, while Base Order P3500.1K (*Range and Training Regulations*) provides additional protection to bird habitats on Base year round through programmatic instructions that limit impacts to existing vegetation. Pest management is coordinated to limit impacts to natural resources.
- Control brown-headed cowbirds and conditions that attract them; control and eradicate nonnative plant species at the watershed/landscape scale and control and eradicate nonnative animal species, including mammalian predators. Detailed information on Camp Pendleton's long established programs to control and eradicate nonnative plant and animal species including cowbirds and invasive plants is covered in Section 4.6. All bird species that are impacted by cowbirds are provided some level of benefit by Camp Pendleton's effort to control cowbirds. Programmatic instructions and housing regulations preclude residents in some areas near sensitive species from having household pets that may prey on migratory birds, including federally listed threatened and endangered species.
- Take actions to minimize the deleterious effects of future development and preserve and protect habitat and the establishment on priorities for protection and restoration.

Camp Pendleton's intends to keep over 85% of its land as open space and to limit development, to the maximum extent practicable, to existing cantonment areas. This development goal supports bird conservation plans that focus on ensuring patch sizes, configuration, connectivity, and diversity of habitats and the minimization of effects of development.

- Develop methodologies and provide data on pressing conservation issues affecting birds, through use of long term monitoring, standardized monitoring protocols, data collection on multiple species during specialized monitoring, and data gathering on species of concern. Camp Pendleton uses standardized monitoring techniques, coordinated with the USFWS when monitoring and conducting population counts. The Base is following the development of habitat conservation plans in adjoining communities to identify proposed monitoring protocols and supports the development of standardized data collection protocols so that results are comparable across space and time.

The Base also supports DoD's policy for integrating neotropical migratory bird management into existing natural resource and land management programs consistent with the military mission. In support of that policy Camp Pendleton participates in the international Partners in Flight (PIF) program, through the establishment and maintenance of Monitoring Avian Productivity and Survivorship (MAPS) stations. The PIF program consists of a network of federal, state, and nongovernmental organizations that promote bird conservation and research, and DoD is an important participant. The MAPS program provides an integrated bird monitoring system for North America by collecting a wide variety of physical and demographic data on migrant and resident birds at these stations. Data collected from all MAPS stations may be used to identify regional and national population trends.

- Manage vegetation communities to create soft edges appropriate to historical vegetation patterns; manage habitats for diversity and natural conditions; ensure that patch sizes, configuration, and connectivity of habitats support desired populations; and increase size and diversity of habitats. Camp Pendleton's ecosystem management approach is based on the concept of maintaining natural systems that support diversity and restore/maintain natural conditions. Where goals, objectives, and recommendations of conservation plans focus on the management of the needs of select focal or secondary species, Camp Pendleton will review those specific requirements to see how they correspond to the Base's other natural resource management goals and requirements.
- Increase communication and coordination between land managers and specialists. Camp Pendleton participates in several regional coordination and informational exchange groups and participates in the development of local regional plans. Final results from surveys conducted on Base are made available to any interested party. Additionally, the publishing of this document will make available to agencies and the public detailed information on Camp Pendleton's programs and natural resources.

OBJECTIVE: Implement MBTA conservation requirements in a manner consistent with military mission requirements.

Priority Planned Actions:

- Maintain the Base's Special Purpose Migratory Bird Permit to move and relocate birds for the purposes of transporting to a wildlife care facility, accommodate mission critical requirements, or otherwise care for the safety of migratory birds, their young, eggs, or nests. Ongoing. [Also applies to Section 4.4.3, first objective.]
- Develop contractual and work order language for contracts and work orders relating to construction, reconstruction, and maintenance projects on the Base to minimize loss of bird nests and costly delays due to MBTA prohibitions. 2002. [Also applies to Section 4.4.3, first objective.]
- Develop protocols, including tracking and reporting, for responding to injured or nuisance birds including active bird nests (with or without eggs or chicks). 2002. [Also applies to Section 4.4.3, first objective.]
- Establish guidelines for installation of exclusion devices in areas where bird access or nesting cause problems. 2003.
- Annually conduct and track (inventory) animal damage control, predator management, and cowbird control activities on Base. Ongoing. [Also applies to Sections 4.2.2, third objective; 4.4.3, first objective; 4.6.2.] [Compliance requirement of Riparian BO (Appx 4, p. 2)]

Other Planned Action:

- Undertake measures to assess threats to the survival and recovery of avian species on Base, including the severity of threats posed by likely predators/competitors. [Also applies to Sections 4.4.2, second objective; 4.5.4.] *

OBJECTIVE: Support regional migratory bird conservation plans' goals, objectives, and recommendations in a manner consistent with military mission requirements.

Priority Planned Actions:

- Encourage establishment of restoration sites near existing high quality sites and population sources to provide a higher probability of being recolonized by locally extirpated species. Ongoing.

- Utilize, to the extent practicable, restoration recommendations from the various migratory bird conservation plans when developing restoration plans. Ongoing
- Utilize recommendations from the various migratory bird conservation plans to help develop research projects. Ongoing.
- Sponsor/support scientific research in support of regional understanding and management goals by qualified personnel. Ongoing. [Also applies to Sections 4.1.2, second objective; 4.2.2, third objective.]
- Develop a monitoring program for wildlife species of regional concern with a specific focus on those species likely to become proposed for listing as threatened or endangered in the near future. 2002. [Also applies to Sections 4.2.2, second objective; 4.5.2, second objective.]
- Participate in Annual Christmas Bird Count on MCAS to compile data on what birds are winter residents on MCAS. Ongoing. [Also applies to Section 4.2.2, third objective.]
- Conduct Spring Bird Count on MCAS to provide a comprehensive record on the numbers of birds at the Station during the spring. Ongoing. [Also applies to Section 4.2.2, third objective.]
- Obtain Audubon Society bird data collected on Camp Pendleton. 2003. [Also applies to Section 4.2.2, third objective.]
- Develop GIS layers of comparable datasets that allow for spatial and temporal change detection in populations of selected species and sensitive habitat types. Ongoing. [also applies to Section 4.2.3.]
- Continue to study the effects of aircraft noise on passerines. Ongoing until 2006. [Also applies to Sections 4.4.1; 4.5.3.] [Compliance requirements of BRAC BO]
- Per the Riparian Ecosystem Conservation Plan and its Biological Opinion, conduct brown-headed cowbird trapping to reduce nest parasitism from this exotic species and to help increase the reproductive success of native bird species. Ongoing. [Also applies to Section 4.6.2.]

Other Planned Actions

- Continue MAPS stations. Study the use of certain habitats by neotropical migratory birds in conjunction with the DoD Partners in Flight program. ***
- Continue to evaluate the status of raptor populations and reproduction on Camp Pendleton. [Also applies to Section 4.2.2, second and third objective.] **

- Obtain additional data on species identified as focus species or species of concern in migratory bird conservation plans. *
- Develop data required to support the goals, objectives, and recommendations of Executive Order 13186. *
- Undertake measures to assess threats to the survival and recovery of avian species on Base, including the severity of threats posed by likely predators/competitors. [Also applies to Sections 4.4.2, first objective; 4.5.4.] *

4.4.3 Wildlife Damage Management (Including Bird Aircraft Strike Hazard)

Camp Pendleton's boundaries interface with both urban and natural environments. Conflicts can arise with nuisance animals (coyotes, ground squirrels, skunks, and rats), which occasionally pose a health or safety hazard. Further, federally listed threatened and endangered species, and other native wildlife can become prey for domestic animals, including pets and feral animals. Camp Pendleton's pest control is through the Facilities Maintenance Division and, if necessary, other local vector/animal control agencies. Wildlife problems previously identified at Camp Pendleton include coyotes around housing areas, bats roosting in buildings, gulls and crows at the landfill, and interference from bird flocks on the runway. Assistance with nuisance animal problems is obtained from the U.S. Department of Agriculture Wildlife Services on a reimbursable basis. All wildlife damage management and control measures on Base are conducted in a humane and judicious manner. To minimize problems from domestic animals and the potential escape and establishment of exotics, the Base has a policy on the possession of pets (most exotic pets are prohibited basewide and some housing areas adjacent to sensitive resources have restrictions on the possession of normal domestic household pets, such as dogs and cats).

Bird collisions with aircraft are a serious threat to flight safety. At MCAS, the problem has been largely with flocking species such as crows, blackbirds, and gulls. Distribution and abundance of bird species that pose a potential hazard can change seasonally and also vary by altitude, temperature, rainfall patterns, and surrounding land use. Several methods are being researched and considered for usage in the MCAS BASH Plan including, but not limited to, the following:

- Bioacoustics. Bioacoustics is taped distress or alarm calls of birds. The equipment required to adequately project these calls includes a cassette tape deck mounted in a vehicle and a speaker mounted on its roof. Special care must be taken to play the tape in short intervals to prevent habituation by the birds. Play the tape for 20 to 30 seconds and then pause briefly. Repeat the procedure several times if necessary. The birds should respond by taking flight or becoming alert/wary. These calls are effective for gulls, blackbirds, starlings, cowbirds, grackles, ravens, crows and some shorebirds. Pyrotechnics could be used in conjunction with bioacoustics to enhance dispersal.

- Pyrotechnics. Pyrotechnics are 12-gauge scare cartridges that produce a secondary explosion to scare the birds from the area. The scare cartridges are launched from either a shotgun or pyrotechnic pistol (M-8 Very Pistol) with a steel sleeve insert to modify the gun to the 12-gauge size. Pyrotechnics have proven effective in dispersing most bird species.
- Propane Gas Cannons. These devices should be operated, especially at dawn and dusk, as birds come into feed and roost. Cannons must be relocated frequently to avoid habituation problems. These devices have been quite effective on gulls, blackbirds and waterfowl.
- Depredation. Birds must be killed occasionally as a reinforcement of other methods. Domestic pigeons and rock doves, European starlings, and house sparrows may be killed without a permit. However, A federal depredation permit, available from the USFWS, is required before killing any birds protected under the MBTA.
- Falconry. Falcons trained for airfield bird dispersal may be effective when used in combination with other frightening techniques and has been quite successful with blackbirds, pigeons and gulls.
- Model Airplanes. The model airplane method uses a radio remote controlled model airplane to disperse birds. The wingspan is approximately 42 inches and is equipped with a wind-powered, noise generator, attached to a wing surface. It has proven effective with large shore birds, waterfowl and wintering vultures.
- Border Collie. The use of Border Collie dogs to disperse birds has proven effective under certain circumstances.
- Fogging. A technique that utilizes a device that resembles types of smoke that effects birds.

Ineffective Methods of Control:

- Stuffed owls and rubber snakes advertised to rid hangars and buildings of birds are usually a waste of money and effort.
- Rotating lights have brought conflicting results, but are generally considered ineffective. Birds quickly habituate to these devices, and the problem remains unsolved.
- Eyespots on aircraft components are being studied in the U.S. and abroad. However, early results suggest the addition of eyespots does not significantly reduce the BASH potential.
- Ultrasonic devices are also not considered effective.

OBJECTIVE: Protect the Base, its inhabitants, and native species from damage or loss due to wild or feral animal predation.

Priority Planned Actions:

- Maintain the Base's Special Purpose Migratory Bird Permit to move and relocate birds for the purposes of transporting to a wildlife care facility, accommodate mission critical requirements, or otherwise care for the safety of migratory birds, their young, eggs, or nests. Ongoing. [Also applies to Section 4.4.2, first objective.]
- Annually conduct and track (inventory) animal damage control, predator management, and cowbird control activities on Base. Ongoing. [Also applies to Section 4.2.2, third objective; 4.4.2, first objective; 4.6.2.] [Compliance requirement of Riparian BO (Appx 4, p. 2)]
- Maintain a contract with wildlife rehabilitation centers for placement of injured or abandoned wildlife. Ongoing.
- Develop contractual and work order language for contracts and work orders relating to construction, reconstruction, and maintenance projects on the Base to minimize loss of bird nests and costly delays due to MBTA prohibitions. 2002. [Also applies to Section 4.4.2, first objective.]
- Develop protocols, including tracking and reporting, for responding to injured or nuisance birds including active bird nests (with or without eggs or chicks). 2002. [Also applies to Section 4.4.2, first objective.]
- Re-publish Standard Operating Procedures for responding to and handling injured, dead, nuisance, or otherwise encountered wildlife. 2004.
- Publicize the problems with feeding wild animals and actively discourage this activity. 2004.

Other Planned Actions:

- Re-publish procedures for handling road killed/injured deer and other larger animals. **
- Establish informational/warning signs in areas with a history of human/animal conflicts. **

OBJECTIVE: Reduce the potential for bird collisions with aircraft.

Priority Planned Actions:

- Complete development of MCAS Bird Aircraft Strike Hazard (BASH) program. 2002.
- Implement the Bird Aircraft Strike Hazard Plan for MCAS. 2002.
- Complete assessment of bird roosting sites on and adjacent to MCAS. 2002.
- Collect data on the seasonality (e.g., flocking behavior) and observations of corvids, passerines, and other potential BASH species; coordinate observation efforts with Air Traffic Control personnel, pilots, safety personnel, and ground crew. 2002.
- Complete “bird-proofing” of MCAS hangars. 2003.

Other Planned Actions:

- Evaluate methods of species control for BASH program (e.g., use of falconry, trained dogs, etc.). [Also applies to Section 4.5.3.] **
- Evaluate the advantages and disadvantages of owls inhabiting hangers. *

4.4.4 Integrated Pest Management

The AC/S Facilities, Facilities Maintenance Division is responsible for pest (e.g., insects, rodents, weedy plants, and disease) management. The Camp Pendleton Pest Management Plan facilitates annual planning and approval of pest control measures. The Pest Management Plan stresses prevention, education. Toxic chemicals are used only as a last resort. Pesticide use in support of Base natural resources management activities complies with applicable requirements, including those of the Federal Insecticide, Fungicide, and Rodenticide Act. Integrated pest management also encompasses exotic plant/weed control (refer to Exotics Species Control).

An integrated Pest Management Plan is updated annually by AC/S Facilities FMD and reviewed by AC/S ES to ensure proposed pest management actions will not detrimentally impact natural resource programs and species recovery efforts.

OBJECTIVE: Comply with the Federal Insecticide, Fungicide, and Rodenticide Act keeping pesticide use to a minimum.

Priority Planned Actions:

- Submit Pest Management Plan to AC/S Environmental Security for review by hazardous waste and natural resource managers. Ongoing.
- Review Pest Management Plan annually to ensure that proposed pest management actions will not detrimentally impact natural resource management and species recovery programs. Ongoing.

OBJECTIVE: Maintain capability to respond to potential incidences of Africanized honeybee infestations.

Priority Planned Actions:

- Ensure that at least one member of the Resource Management Division staff is current on behavior, current distribution, and control techniques for managing Africanized honey bees. Ongoing.
- Maintain informational materials regarding Africanized honeybees. Ongoing.
- Maintain an Africanized Honeybee Response Plan. Ongoing.

4.4.5 Game and Sport Fisheries Management

In support of the recreational hunting and fishing programs on Camp Pendleton (Chapter 5), the Wildlife Management Branch of the Resources Management Division within AC/S Environmental Security is responsible for the management of game species on Base. The Base hunting and fishing programs are subject to applicable federal and state regulations and are managed cooperatively with the California Department of Fish and Game (CDFG). Under Sections 3450 – 3453 of the California Fish and Game Code, Camp Pendleton annually submits for approval the number of deer tags for distribution by both the Base and the State Fish and Game Commission.

While no native freshwater game fish species occur on Camp Pendleton, a few ponds and lakes have been historically managed for game fish as part of a recreational fishery program. Inland freshwater fishing is not currently authorized in rivers or creeks. Inland fishing may be authorized at Horseshoe Lake, Case Spring ponds, Santa Margarita River (above Stewart Mesa Road and in winter months only), Lake O'Neill, Whitman Pond, Pilgrim Creek Pond, Broodmare Ponds, Wildcat Ponds, Windmill Lake, and Las Flores Slough (from I-5 bridge west to the ocean) (see Chapter 5). Fishing is permitted at Pulgas Lake for catch and release only.

The Resources Enforcement/Compliance Branch stocks Lake O'Neill occasionally with exotic game fish, including largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis*

macrochirus), black crappie (*Pomoxis nigromaculatus*), and channel catfish (*Ictalurus punctatus*). Rainbow trout (*Salmo gairdnerii*) and red-eared sunfish (*Lepomis microlophus*) have previously been recorded as having been stocked on Camp Pendleton.

Wildlife game species at Camp Pendleton include California quail (*Callipepla californica*), mourning dove (*Zenaida macroura*), desert cottontail (*Sylvilagus audubonii*), black-tailed jackrabbit (*Lepus californicus bennetti*), brush rabbit (*Sylvilagus bachmani*), southern mule deer (*Odocoileus hemionus fuliginatus*), and several waterfowl species. Management practices benefiting game species on Base include providing additional water sources, controlled burns, brush management, food plantings, and population inventories.

Hunting and active management of the southern mule deer (*Odocoileus hemionus fuliginatus*) population at Camp Pendleton has been ongoing since at least 1955. To facilitate management of this species, the Base contracted Floyd W. Weckerly of Humboldt State University (Weckerly 1998) to analyze years worth of accumulated deer survey and hunting data, review the existing management plan, and develop a revised management plan to maintain sustained yield hunting on Base. Findings from that study indicated that the Camp Pendleton management program for the deer population is sound and effective. Additional recommendations were also provided.

OBJECTIVE: Provide quality and sustainable hunting and fishing by protecting and enhancing habitat for game species and managing populations near the optimal carrying capacity.

Priority Planned Actions:

- Continue to collect and analyze data from harvested animals to support informed fish and game management decisions. Ongoing.
- Annually review the Base hunting program to ensure that it remains sustainable and compatible with wildlife management goals. Ongoing.
- Conduct an annual fish and game survey to evaluate sustainable hunting and fishing levels. Ongoing.
- Develop a Game Management Plan for small game and upland game species (incorporating fisheries and deer management plans). 2003. [Also applies to Section 5.2.1.]
- Evaluate the feasibility and desirability of expanding inland/freshwater fishing opportunities to the general public. 2004. [Also applies to Sections 5.1.1; 5.2.2.]

- Develop a Fisheries Management Plan to address the adverse impacts to Camp Pendleton's fresh water lakes and ponds from siltation, stagnation, exotic species and aquatic plants. 2005. [Also applies to Sections 5.2.2.]

Other Planned Actions:

- Conduct a Comprehensive Freshwater Fisheries Management Study. [Also applies to Section 5.2.2.] ***
- Evaluate the efficacy of maintaining artificial sources of water availability for wildlife (via use of guzzlers and small earthen dams). *
- Assess the feasibility and desirability of expanding the hunting program to include additional or introduced species. If desirable and feasible, coordinate changes through normal Base staffing procedures and the Base NEPA processes. [Also applies to Section 5.2.1.] *
- Evaluate the feasibility and desirability of installing a low cost/maintenance water quality improvement system for Lake O'Neill. [Also applies to Section 5.2.2.] *

4.5 THREATENED AND ENDANGERED SPECIES MANAGEMENT

While the Base's natural resource management philosophy is that program initiatives should be ecosystem based, special attention is provided to threatened and endangered species and their habitats to prevent "jeopardy" and to assist in the conservation and recovery of those species. As such, the Base maintains habitats sufficient to sustain existing species populations while also allowing for potential growth. The Marine Corps recognizes the importance of maintaining natural landscapes, wherever possible, as a mission essential element in training and views effective conservation and management of natural resources as an integral component of the long term viability of the military training mission itself. To balance training mission with the protection of listed species and their habitats, the following guiding principles are key to Camp Pendleton's listed species management programs:

- The primary focus of avoidance and minimization of impacts to listed species will be on occupied habitat. Without a thorough understanding of the necessary components defining suitable habitat for a species, it is difficult to accurately predict locations of potential habitat.
- Should populations of threatened or endangered species increase in size and geographic area across the Base, there will not be a concomitant increase in restrictions to training or support activities. (Camp Pendleton's mission will not be penalized by good management practices that lead to an increase in listed upland species populations.)

- Habitat enhancement, restoration, and other efforts conducted as compensation for permanent and temporary impacts from ongoing Base activities will not further reduce the overall land available to training. (All compensation measures should be compatible with training in the long term.)
- Programmatic instructions will be the primary tool for facilitating avoidance and minimization of potentially adverse impacts to the environment in general and listed upland species in particular.
- Programmatic instructions should be unambiguous and simple, while being neither undesirably restrictive nor lenient. Complex management rules foster greater difficulty in enforcement and achieving compliance.
- Management programs provide incentives for avoiding permanent impacts to listed species occupied habitat and place limits on the amount of permanent impact that is allowable.
- A programmatic approach for processing/consulting on future construction projects (permanent impacts) will clearly define the required level of communication between the Base and the USFWS and make mitigation costs more predictable.
- Listed species management will be adaptive, incorporating knowledge gained over time and accommodating potential changes in natural resource and military training and mission support needs.

The primary legislation regulating actions that may directly or indirectly impact federally listed species is the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq.*). Camp Pendleton regularly consults with the USFWS to ensure that Marine Corps actions are not likely to jeopardize the continued existence of any endangered or threatened species and are within compliance with Sections 7 and 9 of the ESA. Pursuant to Section 7 of the ESA, federal agencies such as the Marine Corps must consult with USFWS if their action "may affect" a federally listed endangered or threatened species (50 CFR 402). Such consultations may be formal or informal. When necessary, Camp Pendleton prepares a biological assessment of the effects of a proposed action on listed species, as required by Section 7 of the ESA, which serves to conserve endangered and threatened species. Section 9 of the ESA prohibits the take of a threatened or endangered species. A take includes the direct killing, harming, or harassing of a species, or destruction of habitat that may be important for the species' survival or recovery.

Camp Pendleton's management approach to federally listed threatened and endangered species is to implement measures to avoid and minimize adverse impacts; proactively collect information on presence or absence, location, habitat availability and suitability, and life history requirements; and compensate/mitigate for impacts that do occur. For some species and some locations on Base, habitat enhancement and restoration have been, and will continue to be, used as compensation/mitigation and to help meet management and recovery goals.

To ensure that ongoing and future military mission requirements (including training, support activities, maintenance, fire management, natural resource management, etc.) on Base are in compliance with the ESA, Camp Pendleton developed and consulted with the USFWS on conservation programs for federally listed species and their habitats on Base. In 1995, Camp Pendleton received a Biological Opinion from the USFWS (1995a) covering the Estuarine and Beach Ecosystem Conservation Plan (Appendix D) and the Riparian Ecosystem Conservation Plan (Appendix E). Appendix S contains the reasonable and prudent measures, terms and conditions, and conservation recommendations from the Riparian BO (USFWS 1995a). This Biological Opinion serves to ensure that actions funded, authorized, or carried out by the Base in the performance of its military training mandate do not jeopardize the continued existence of any listed or proposed species. Included in these conservation plans and concurred with by the Biological Opinion (1-6-95-F-02) are goals for species population size or habitat acreage that identify Camp Pendleton's conservation responsibility within ecoregion species recovery efforts (Table 4-1) and a habitat value system for riparian ecosystems on Camp Pendleton.

TABLE 4-1. Federally listed riparian and estuarine/beach species population goals.

Species	Goal
Least Bells Vireo	200 (territorial males)
Southwest Willow Flycatcher	20 (territorial males)
California Least Tern	[BO #1-6-95-F-02: Maintain the current population and promote its growth]
Western Snowy Plover	40 (breeding pairs)
Arroyo Southwestern Toad	Maintain Existing Habitat
Tidewater Goby	Maintain Existing Habitat

Currently, the Base is in consultation with the USFWS on the Biological Assessment of Upland Habitats on Camp Pendleton and the associated Listed Upland Species Management Program. The USFWS is expected to issue a Biological Opinion by the end of 2002. The Listed Upland Species Management Program will be added as Appendix F and Upland terms and conditions will be added as Appendix T once the Biological Opinion is issued.

As part of each conservation plan a Consultation Class System has been established that provides a programmatic approach for directing future consultations on permanent impact projects. The purpose of this programmatic approach is to: (1) satisfy Section 7(e)(2) of the ESA requirements for future consultations; (2) provide a systematic method for dealing with future proposed projects in a consistent, predictable manner; (3) increase the Base's mission

flexibility; (4) identify activities which require formal consultation with the USFWS; and (5) reduce staff time.

The Consultation Class System does not negate requirements for consultation in the future. On the contrary, it is intended to clarify which projects require consultation and which are “programmatically” covered by programmatic management programs (and their respective Biological Opinions) and receive expedited implementation. The Consultation Class System has been established for riparian, estuarine and beach ecosystem and proposed (pending completion of formal Section 7 consultation) for uplands. The Consultation Class System establishes annual reporting procedure for newly initiated Base activities, the effects of which are relatively minor and easily covered under the conservation plan. Further, the system defines types of activities for which an expedited consultation process can be implemented.

Under the Consultation Class System, proposed activities are assigned to one of the following consultation class categories: I, II, III, or IV. The action required by Camp Pendleton and the USFWS for each consultation class category was established during formal Section 7 consultation on the management plans and is summarized in Table 4-2. Determination of consultation class level for a proposed project depends largely upon the timing, location, and size of the project relative to the species potentially impacted.

TABLE 4-2. Consultation class categories and action required.

Consultation Class	Action Required
I	Impacts not offset by program. Individual consultation required.
II	Impacts primarily offset by management plan. Concurrence letter from USFWS required for specific project.
III	Impacts completely offset by management plan. USFWS notified annually of Class III projects occurring during previous year.
IV	No impacts to listed species. No reporting required.

GOAL: Incorporate principles of ecosystem management into threatened and endangered species management.

GOAL: Maintain existing populations of federally listed species and survey for new populations and existing populations.

GOAL: Conserve and manage threatened and endangered species in accordance with all environmental laws and their implementing regulations.

GOAL: Conduct research on the population dynamics of threatened and endangered species in order to make recommendations that assist in their survival and recovery.

4.5.1 Avoidance/Minimization and Awareness

Central to the management of listed species on Base and key to each conservation plan is the avoidance and minimization of adverse impacts to those species and their habitats. While the Base cannot control natural population fluctuations, it can and does manage anthropogenic disturbance to listed species and their habitats. Thus, the general management approach on Base can be characterized as the “managing of impacts.” As such, management programs are generally divided into two components, one for the management of impacts that are *temporary* (e.g., from ongoing activities such as training, maintenance, and recreation) and one for those that are *permanent* (e.g., from infrastructure development projects).

Ongoing military training and mission support activities create impacts that are generally temporary in nature and avoidance and minimization of these impacts are accomplished via programmatic instructions. Further discussion of the implementation and enforcement of these programmatic instructions is provided in Section 4.0.2.2. In addition to programmatic instructions, physical measures may be enacted to facilitate avoidance or minimization of impacts to sensitive resources, including fencing and relocation. For permanent projects, the NEPA process and Public Works Department site selection and approval process facilitate avoidance and minimization of adverse impacts (see Environmental Planning, Section 4.12). Additionally, the Consultation Class System, programmatic instructions, and pre-established mitigation, included in each ecosystem conservation plan, encourages avoidance and minimization through reduced project costs and efforts when listed species and their habitat are avoided.

OBJECTIVE: Implement avoidance and minimization measures in accordance with ESA Section 7 consultations.

Priority Planned Actions:

- Continue to publish in Base/Station Orders and other relevant documents measures necessary for compliance with the Riparian BO. Ongoing.
- Publish in Base Orders and other relevant documents measures necessary for compliance with the Upland Biological Opinion when completed by the USFWS. Ongoing.
- Every six months, update the Base’s Environmental Operations Maps to include the most current species and natural resource data. Ongoing. [Also applies to Section 4.14.2, first objective.]

- Facilitate distribution of updated Environmental Operations Maps to Base users. Ongoing. [Also applies to Section 4.14.3.]
- Execute commitments, terms and conditions of all formal and informal consultation documents that apply on the Base to which the Marine Corps or another DoD agency agreed. Ongoing.
- Where possible and reasonable, adopt the least damaging alternative of proposed activities that have potential to result in the permanent loss of listed species habitats. Use the Activity/Consultation Class System to determine the required level of consultation with the USFWS for new projects. Ongoing. [Also applies to Section 4.5.4.] [Compliance requirement of Riparian BO (Appx 5, p. 4: implem Appx 1, p. 68)]
- Annually fence and post warning signs around the endangered least tern and snowy plover nesting areas in accordance with the Estuarine Ecosystem Conservation Plan. Ongoing. [Also applies to Section 4.5.4.] [Compliance requirement of Riparian BO (Appx 5, p. 6, implem Appx 1 mgmt plan)]
- Use various media to create and maintain awareness of Base personnel, general public, and lease and easement holders of the sensitivity, values, and obligations regarding the conservation of federally listed threatened and endangered species and their habitat. This includes presentations, briefs, newspaper articles, special messages, informational brochures, and interpretive signs. Ongoing. [Also applies to Section 4.3.2.]
- Train natural resources staff responsible for listed species management regarding species under their primary areas of responsibility on a regular basis. Ongoing.
- Where feasible, salvage federally listed and sensitive native plant species from new project construction sites for transplantation to suitable and more protected locations. Ongoing.
- Review and modify avoidance and minimization measures as additional information or specific results are obtained. Ongoing.
- Erect signage on MCAS to discourage unauthorized usage of sensitive habitats. 2002.
- Upon receipt from the USFWS, develop and implement the commitments and required elements contained within the Upland Biological Opinion. TBD. [Also applies to Section 4.3.2.]

4.5.2 Surveys and Monitoring

Federally listed threatened and endangered species within riparian and estuarine/beach habitats on Base are monitored at levels and frequency intervals specified within the Estuarine and Beach Ecosystem Conservation Plan (Appendix D), the Riparian Ecosystem Conservation Plan (Appendix E), and their Biological Opinion (USFWS 1995a). Listed upland species are also currently monitored; however, the level and frequency intervals for future monitoring are presently under consultation with the USFWS. Site specific surveys for listed species known to occur on Base are also conducted for individual projects where necessary. Surveys for selected listed species not presently known to occur on Base or for candidate species that may become listed are also conducted when funds and opportunities become available.

Surveys and monitoring are used to determine species populations, habitat levels, and habitat values that are used to help determine the effectiveness of Camp Pendleton's conservation and management programs.

OBJECTIVE: Maintain up-to-date distribution, population dynamic, and habitat data for all federally listed threatened and endangered species and species proposed to be listed as threatened or endangered that are *known to occur on Base*.

Priority Planned Actions:

- Monitor annually the threatened western snowy plover population and locations, providing estimates of the number of breeding individuals, reproductive success, distribution, abundance, and habitat. Ongoing. [Also applies to Section 4.2.2, first objective.] [Compliance requirement of Riparian BO (Appx 4, p. 2)]
- Monitor annually the endangered California least tern population, providing estimates of the number of breeding individuals and the reproductive success. Ongoing. [Also applies to Section 4.2.2, first objective.] [Compliance requirement of Riparian BO (Appx 4, p. 2)]
- Annually monitor the population and distribution of the endangered arroyo toad. Ongoing. [Also applies to Section 4.2.2, first objective.] [Compliance requirement of Riparian BO (Appx 5, p. 5)]
- Periodically conduct arroyo toad surveys of MCAS. Ongoing. [Also applies to Section 4.2.2, first objective.]
- Annually monitor the population levels and distributions of the endangered least Bell's vireo. Ongoing. [Also applies to Section 4.2.2, first objective.] [Compliance requirement of Riparian BO (Appx 4, p.2; 5, p. 5)]

- Annually monitor the population levels and distributions of the endangered southwestern willow flycatcher. Ongoing. [Also applies to Section 4.2.2, first objective.] [Compliance requirement of Riparian BO (Appx 4, p.2; 5, p. 5)]
- Annually monitor a portion of Base estuaries for the endangered tidewater goby population ensuring that each estuary is monitored at least every 3 years. Ongoing. [Also applies to Section 4.2.2, first objective.] [Compliance requirement of Riparian BO (Appx 4, p. 2 - every 3 yrs)]
- Incorporate project specific survey data for federally listed species into the GIS species distribution database. Ongoing. [Also applies to Section 4.2.2, first objective.]
- Incorporate U.S. Geological Survey and CDFG fish survey data into GIS species distribution database. 2003. [Also applies to Section 4.2.2, third objective.]
- Assess the feasibility and desirability of conducting off-Base surveys of selected species and habitat types, water quality monitoring, and hydrographical surveys to contribute to the understanding of Camp Pendleton's regional contribution to species and habitat conservation and recovery. 2003. [Also applies to Sections 4.1.2, second objective; 4.2.1, first objective; 4.2.2, first and second objectives; 4.5.2, second objective.]
- Monitor selected plots every other year for the endangered Pacific pocket mouse population. Conduct comprehensive surveys for the endangered Pacific pocket mouse at intervals determined in the Uplands Biological Opinion. TBD. [Also applies to Section 4.2.2, first objective.]
- Survey for the southern steelhead as determined in consultation with National Marine Fisheries Service. As needed, conduct genetic tests on a representative sample. TBD. [Also applies to Section 4.2.2, first objective.]
- Monitor and document changes in the population and distribution of the threatened California gnatcatcher at intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD. [Also applies to Section 4.2.2, first objective.]
- Monitor and document changes in the population and distribution of the endangered Stephens' kangaroo rat at intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD. [Also applies to Section 4.2.2, first objective.]
- Collect survey data on isolated ephemeral wetland invertebrates, including the endangered San Diego fairy shrimp and the Riverside fairy shrimp at levels and intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD. [Also applies to Sections 4.2.2, first, second, and third objectives; 4.5.2 second objective.]

- Conduct surveys for the endangered San Diego button-celery at levels and intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD. [Also applies to Section 4.2.2, first objective.]
- Conduct surveys for the threatened spreading navarretia at levels and intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD. [Also applies to Section 4.2.2, first objective.]
- Conduct surveys for the thread-leaved brodiaea at levels and intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD. [Also applies to Section 4.2.2, first objective.]

Other Planned Action:

- Facilitate annual light-footed clapper rail surveys on Base. [Also applies to Section 4.2.2, first objective.] [Compliance requirement of Riparian BO (Appx 1, p. 83)] ***

OBJECTIVE: Survey for species that are *not currently federally listed* but for which there may be a likelihood of becoming listed in the future.

Priority Planned Actions:

- Develop and annually maintain a prioritized list of state listed plant species and species identified by the California Native Plant Society as rare or sensitive that occur on Camp Pendleton. Ongoing.
- Develop a monitoring program for wildlife species of regional concern with a specific focus on those species likely to become proposed for listing as threatened or endangered in the near future. 2002. [Also applies to Sections 4.2.2, second objective; 4.4.2, second objective.]
- Assess the feasibility and desirability of conducting off-Base surveys of selected species and habitat types, water quality monitoring, and hydrographical surveys to contribute to the understanding of Camp Pendleton's regional contribution to species and habitat conservation and recovery. 2003. [Also applies to Sections 4.1.2, second objective; 4.2.1, first objective; 4.2.2, first and second objectives; 4.5.2, first objective.]
- Collect survey data on isolated ephemeral wetland invertebrates, including the endangered San Diego fairy shrimp and the Riverside fairy shrimp at levels and intervals to be determined in the Uplands Biological Opinion issued by the USFWS. TBD. [Also applies to Sections 4.2.2, first, second, and third objectives; 4.5.2 first objective.]

Other Planned Actions:

- Develop an inventory program for wildlife species of regional concern with a specific focus on those species on the Base likely to become proposed for federal listing as threatened or endangered in the near future. [Also applies to Section 4.2.2, second objective.] ***
- Survey for species on Base that have been proposed for ESA listing by the USFWS. [Also applies to Section 4.2.2, second objective; 4.4.2, second objective.] ***

4.5.3 Research

Essential to adaptive management, and to recovery efforts for listed species, is the knowledge gained from experimental studies and investigative research. It is the Base's intent to conduct, or allow qualified researchers/professionals to conduct, research that has the potential to provide information that supports effective avoidance, minimization, mitigation, and both regional recovery efforts. Such research is absolutely necessary if recovery efforts are to advance beyond trial and error for those species about which little is currently known. Investigative research can address specific questions about life history characteristics, habitat preferences, and response to disturbance to better facilitate avoidance and recovery efforts. All research proposals will be reviewed by appropriate Base professionals to help ensure the utility of the data collected, the study design and methodologies support the hypothesis, unintended adverse impacts are avoided, and the project supports regional natural resource management goals and objectives.

Following are examples of Base sponsored research efforts that have contributed to the understanding of the ecology of the species, potential threats, and management requirements of federally listed threatened and endangered species:

- Effects of Wildfire on Coastal California Gnatcatchers. Initiated in 1998, a multi-year study by Atwood et al. (1999, 2000) from the Antioch New England Institute (New Hampshire) has been collecting data on the ecology and behavior of the California gnatcatcher on Camp Pendleton, focusing in particular on how gnatcatcher habitat quality and distribution is influenced by fire. Funded by Camp Pendleton, this research is expected to contribute to a greater understanding of the behavior and ecology of this federally listed threatened species for natural resource managers both on Base and within the region. Final study results are for this project are still pending.
- Habitat Suitability Evaluation for Endangered Southern Steelhead Trout. A habitat suitability study (USFWS 1998f), completed in 1997 for all Base streams, evaluated the potential for the San Onofre, San Mateo, and Santa Margarita River watersheds to support runs of southern steelhead. The results of this report have provided valuable information to the Base natural resource managers and are used by other professional

biologists in the region as a means for evaluating potential steelhead recovery efforts in southern California.

- Upland Habitat Studies for Listed Species. Recently, the Base contracted the USFWS to develop methodology for identifying upland habitat areas that are important to actively manage for selected listed upland species, including the coastal California gnatcatcher, Stephens' kangaroo rat, Pacific pocket mouse, and thread-leaved brodiaea. Development of this methodology will enable the Base to better maintain habitat for listed upland species populations during project planning and will identify sites for potential future mitigation, compensation, or stewardship.

Among other required elements, this research will involve (1) determining the utility of existing data and imagery for monitoring landscape level habitat changes; (2) mapping of selected areas and field verification of existing GIS layers; (3) locating, designating, and mapping all habitat within selected areas that has the potential to become suitable for federally listed upland species; (4) determining the general restoration approach for potential habitat areas; and (5) prioritizing the importance of selected habitat areas, including consideration of patch size and connectivity/proximity to adjacent populations and habitat (both on and off Base). This research is scheduled for completion by the end of 2001.

- California Least Tern Studies. The largest and most productive California least tern colony is found on Camp Pendleton and has been intensively studied since 1983 (see Belluomini 1993, and references therein). From 1989 to 1992, the Denver Wildlife Research Center conducted research on the interactions between terns and ravens (*Corvus corax*) at Camp Pendleton (Linz et al. 1990, 1992). The initial year's study focused on determining home ranges and habitat use patterns of territorial ravens in relation to the tern colony at White Beach (Linz et al. 1990, 1992). A 1992 study conducted by the U.S. Department of Agriculture (Avery et al. 1993), funded in part by the U.S. Navy (contract number N68711-92-LT-2006), investigated predation of California least tern eggs by common ravens, conducted experiments using nonlethal aversive techniques, and proposed management methods.

OBJECTIVE: Conduct and/or support research that has the potential to provide information that supports effective avoidance, minimization, mitigation, local and regional recovery efforts.

Priority Planned Actions:

- Establish test plots to understand best management practices for natural resource recovery after wildland fire impacts. Ongoing. [Also applies to Sections 4.6.1; 4.7.2, first objective; 4.11.3.]

- Conduct assessments of potential mitigation and management techniques for listed species. Ongoing. [Compliance requirement of Riparian BO (Reasonab & Prud, p. 32; T&C, p. 35)]
- Continue to study the effects of aircraft noise on passerines. Ongoing until 2006. [Also applies to Sections 4.4.1; 4.4.2, second objective.] [Compliance requirements of BRAC BO]
- Undertake measures to assess threats to the survival and recovery of the tidewater goby and arroyo toad on Base, including the severity of threats posed by green sunfish, bullfrog, steelhead trout and other likely predators/competitors and hydro modification. 2005. [Also applies to Sections 4.5.4; 4.6.2.] [Compliance requirement of Riparian BO (T&C, p. 35)]
- Undertake measures to assess threats to the survival and recovery of the western snowy plover and California least tern, including the severity of threats posed by likely predators/competitors. 2006. [Also applies to Sections 4.5.4; 4.6.2.]
- Undertake measures to assess threats to the survival and recovery of the least Bell's vireo and southwestern willow flycatcher, including the severity of threats posed by likely predators/competitors. 2006. [Also applies to Sections 4.5.4; 4.6.2.]
- Undertake measures to assess threats to the survival and recovery of the California gnatcatcher, including the severity of threats posed by likely predators/competitors. 2006. [Also applies to Sections 4.5.4; 4.6.2.]
- Undertake measures to assess threats to the survival and recovery of the pacific pocket mouse on Base, including the severity of threats posed by likely predators/competitors. 2006. [Also applies to Sections 4.5.4; 4.6.2.]
- Undertake measures to assess threats to the survival and recovery of the Stephens' kangaroo rat on Base, including the severity of threats posed by likely predators/competitors. 2006. [Also applies to Sections 4.5.4; 4.6.2.]

Other Planned Action:

- Evaluate methods of species control for the Bird Aircraft Strike Hazard program (e.g., use of falconry, trained dogs, etc.). [Also applies to Section 4.4.3, second objective.] *

4.5.4 General Management (Including Compensation and Mitigation)

Management of federally listed species on Camp Pendleton includes proactive conservation initiatives, compensation for the potential temporary impacts from ongoing mission and

mission support activities (training, maintenance, recreation, etc.), programmatic instructions and a Consultation Class System to support avoidance and minimization and mitigation for permanent project impacts. General management initiatives for threatened and endangered species include predator control, habitat enhancement (e.g., exotics control), and habitat restoration. Some of these management actions also function as compensation and mitigation measures.

OBJECTIVE: Conduct management initiatives that contribute to the recovery of listed or candidate species' populations and that maintain or improve their habitats.

Priority Planned Actions:

- Where possible and reasonable, adopt the least damaging alternative of proposed activities that have potential to result in the permanent loss of listed species habitats. Use the Activity/Consultation Class System to determine the required level of consultation with the USFWS for new projects. Ongoing. [Also applies to Section 4.5.1.] [Compliance requirement of Riparian BO (Appx 5, p. 4: implem Appx 1, p. 68)]
- Enhance and manage dunes within nesting areas. Maintain and improve the endangered least tern breeding habitat and evaluate the design and feasibility of sand augmentation to the island in the Santa Margarita River. Ongoing. [Compliance requirement of Riparian BO, T&C, Appx. 1, p. 80]
- Mitigate all direct or indirect permanent impacts to federally listed species according to the measures and ratios determined in coordination with the USFWS. Ongoing.
- Where feasible and practical, use native seed stock in restoration and enhancement measures. Ongoing. [Also applies to Sections 4.6.1; 4.7.2, second objective.]
- Conduct control measures on exotic, invasive species that have a potential direct or indirect adverse impact on federally listed species or their habitat. Ongoing. [Also applies to Sections 4.6.1; 4.6.2.] [Compliance requirement of Riparian BO (Appx 1, p. 79)]
- Continue predator control measures within the vicinity of snowy plover and least tern nesting sites. Ongoing. [Compliance requirement of Riparian BO (Appx. 1, p. 80)]
- Annually maintain the endangered California least tern and threatened western snowy plover nesting areas. Ongoing. [Compliance requirement of Riparian BO (general project description)]

- Ensure that secondary roads are maintained to the extent practical in order to avoid ponding of water on the road surface in and adjacent to potential arroyo toad habitat. Ongoing. [Compliance requirement of Riparian BO (T&C, Appx. 5, p. 2)]
- Ensure that construction activities are within compliance with the terms and conditions for new construction sites in the Estuarine and Beach Ecosystem Conservation Plan, the Riparian Ecosystem Conservation Plan, the Listed Upland Species Management Program and their respective Biological Opinions, and other applicable regulations and guidelines. Ongoing.
- Publish notices and/or Base newspaper articles to Base personnel regarding sensitive species and restricted areas along the coast. Ongoing. [Compliance requirement of Riparian BO (Appx 1, p. 79)]
- Annually fence and post warning signs around the endangered least tern and snowy plover nesting areas in accordance with the Estuarine Ecosystem Conservation Plan. Ongoing. [Also applies to Section 4.5.1.]
- Explore habitat enhancement techniques for Camp Pendleton estuaries and lagoons including deepening smaller estuarine lagoons and controlling and removing exotic plants and fish. Ongoing. [Compliance requirement of Riparian BO (Appx. 1, p. 80)]
- Protect the last known nesting location of the light-footed clapper rail (Santa Margarita River). Ongoing. [Compliance requirement of Riparian BO (Appx. 1, p. 80)]
- Evaluate the feasibility of participating in cooperative watershed restoration programs, including cooperating with local governmental and nongovernmental stakeholders. Ongoing. [Also applies to Sections 4.1.2, second objective; 4.3.1, first objective; 4.7.1, first objective.]
- Undertake measures to assess threats to the survival and recovery of the tidewater goby and arroyo toad on Base, including the severity of threats posed by green sunfish, bullfrog, steelhead trout, and other likely predators/competitors and hydro modification. 2005. [Also applies to Sections 4.5.3; 4.6.2.] [Compliance requirement of Riparian BO (T&C, p. 35)]
- Complete and evaluate results of the multi-year study of effects of least tern management on western snowy plovers. Make adjustments to the Estuarine/Beach Ecosystem Conservation Plan if necessary. 2005. [Compliance requirement of Riparian BO (Appx 5, p. 6)]
- Undertake measures to assess threats to the survival and recovery of the pacific pocket mouse on Base, including the severity of threats posed by likely predators/competitors. 2006. [Also applies to Sections 4.5.3; 4.6.2.]

- Undertake measures to assess threats to the survival and recovery of the Stephens' kangaroo rat on Base, including the severity of threats posed by likely predators/competitors. 2006. [Also applies to Sections 4.5.3; 4.6.2.]
- Undertake measures to assess threats to the survival and recovery of the western snowy plover and California least tern, including the severity of threats posed by likely predators/competitors. 2006. [Also applies to Sections 4.5.3; 4.6.2.]
- Undertake measures to assess threats to the survival and recovery of the least Bell's vireo and southwestern willow flycatcher, including the severity of threats posed by likely predators/competitors. 2006. [Also applies to Sections 4.5.3; 4.6.2.]
- Undertake measures to assess threats to the survival and recovery of the California gnatcatcher on Base, including the severity of threats posed by likely predators/competitors. 2006. [Also applies to Sections 4.5.3; 4.6.2.]

Other Planned Actions

- Undertake measures to assess threats to the survival and recovery of avian species on Base, including the severity of threats posed by likely predators/competitors. [Also applies to Section 4.4.2, first and second objectives.] *

4.6 EXOTIC INVASIVE SPECIES CONTROL

One of the most severe environmental problems facing the Base's natural areas is the explosive spread of exotic invasive species. The term invasive species is defined by the Presidential Executive Order 13112 to mean "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." The Executive Order goes on to define an alien species as any species not native to a particular ecosystem, including the seeds, eggs, spores, or other biological material capable of propagating that species.

Exotic invasive plants and animals have the potential to cause vast ecological and economic damage, and sometimes pose human health impacts in areas they infest. Among the potential adverse impacts caused by exotic invasive species are:

- A decrease in biodiversity of native communities as a result of competitive exclusion, predation, parasitism, disease, etc.;
- A reduction in habitat quantity and quality for native species (including threatened, endangered, and sensitive species) through the alteration of forage, shelter requirements, water availability/quality, etc.;

- Impairing ecosystem functioning capabilities in general as a result of increased soil erosion, stream sedimentation, clogged waterways, altered nutrient cycling, increased flooding, etc.;
- An increase in susceptibility to wildfires;
- A decrease in the quality or availability of training lands in areas of heavy infestation; and
- Human health risks.

The purpose of the exotic invasive species control program is to develop and implement a strategy for the control of such plants and animals on Base. "Control" means, as appropriate, the eradication, suppression, reduction, or management of invasive species populations; the prevention of invasive species introductions and their spread from already infested areas; and the reduction of potential adverse effects of invasive species through, for example, the restoration of native species (EO 13112).

Subject to the availability of funds this program will endeavor to: (1) prevent the introduction of invasive species; (2) detect and respond rapidly to and control populations of invasive species in a cost effective and environmentally sound manner; (3) monitor invasive species populations accurately and reliably; (4) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (5) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (6) promote education on and awareness of invasive species.

All field efforts to conduct exotic species control are performed in an experimental fashion prior to basewide/broadcast treatment to ensure efficacy of techniques under local conditions and avoidance of unintended adverse impacts to native species.

GOAL: Seek to eliminate invasive exotic species from Camp Pendleton to conserve and enhance native flora and fauna and the functional value of natural systems.

GOAL: Seek to understand natural processes and impacts of invasive exotic species through monitoring, investigative research, and data analysis in order to make informed decisions necessary for exotic species management.

4.6.1 Exotic Invasive Plants

Of the more than eight hundred plant species on Base, nearly 20% are considered exotic (i.e., nonnative to California). The abundance of exotic, weedy plant species poses a special problem for natural resource management at Camp Pendleton. Invasive, exotic plants are often detrimental to native communities in that they may compete with native plant species, reduce the diversity and quantity of native species; render habitat unsuitable for native animals by altering forage and shelter requirements; cause increased rates of erosion and

stream sedimentation; create a system that is more susceptible to wildfires; and impair general ecosystem functioning.

To help reduce exotic plant species on Base and to compensate for temporary and permanent impacts from ongoing training activities, Camp Pendleton has conducted removal efforts for several targeted species. These include the giant reed grass (*Arundo donax*), artichoke thistle (*Cynara cardunculus*), and perennial pepperweed (*Lepidium latifolium*). The Base has not formally approved a basewide exotic plant control program, but a conceptual plan has been developed. The riparian portion of this program has been completed and implementation has begun in selected riparian areas of the Base. This exotic plant control plan focuses on high priority sites, targeting weedy, invasive upland species, including artichoke thistle, mustard (*Brassica* spp.) fennel (*Foeniculum vulgare*), iceplant (*Mesembryanthemum crystallinum*), tamarisk (*Tamarix parviflora*), and tree tobacco (*Nicotiana glauca*). Artichoke thistle was nearly eradicated from the Base during previous exotics control efforts. However, new infestations have recently been identified in several locations within the State Parks lease area. Plans are currently underway to identify, map, and eradicate these new infestations and prevent reinfestation of the Base.

As part of the exotic plant removal program, Camp Pendleton has been involved in partnering efforts to help ensure that exotics removal on Base is consistent with, and contributes to, regional efforts. Since 1995, the Marine Corps has been partnering with federal regulators, The Nature Conservancy, and private land owners and participating in “Team *Arundo*” workshops to implement a systematic multi-year *Arundo donax* (giant reed) control program on the Santa Margarita River. *Arundo* is an invasive, non-native plant that has infested and adversely affected much of the riparian habitat within southern California watersheds in general and the Santa Margarita River watershed in particular. Approaching the control of *Arundo* from a regional perspective has enabled removal efforts to begin as far up stream as possible to preclude downstream spread or re-infestation from upstream sources. Since 1995, *Arundo* treatments have been initiated at site specific locations along a 17-mile section of the watershed and are in various stages of completion. All control projects were initially funded for 5-year treatment periods through the Endangered Species Act and Clean Water Act mitigation requirements and/or as part of Camp Pendleton’s environmental stewardship program. Lessons learned for these control efforts are being translated into greater understanding of cost reductions, control efficiencies, treatment effectiveness, and plant community responses in the San Luis Rey River exotics control programs, as well as other watershed management efforts within the southern California ecoregion. The Santa Margarita and San Luis Rey Weed Management Area (SMSLR/WMA) program, sponsored and coordinated by the Mission Resource Conservation District (Mission RCD), is a follow-on program for weed management at the watershed scale. The Mission RCD has initiated planning efforts for the continued development and implementation of regional *Arundo* control.

Camp Pendleton plays an active role in the organization, with staff having assisted in writing several grant proposal letters for the SMSLR/WMA program. In addition, Base staffs from Office of Water Resources, Land Management Branch, and Wildlife Management Branch attend periodic SMSLR/WMA meetings.

The Base and the SMSLR/WMA coordinate exotics control project activities to ensure no "gaps" exist on the Santa Margarita River. In this way, Camp Pendleton ensures that upstream sources of *Arundo* are being reduced, thereby preventing re-infestation of *Arundo* on Base lands. Camp Pendleton has further contributed to the watershed based *Arundo* control efforts along the Santa Margarita River by carrying out *Arundo* removal on Fallbrook Public Utilities District lands situated upstream from the Base. This has greatly contributed to the watershed based *Arundo* control effort. This effort counts for mitigation for the Base, while contributing to improved sensitive species habitat, recreation, flood control, and long-term fire risk reduction for public land used by many Fallbrook residents.

OBJECTIVE: Endeavor to control the spread, and prevent the introduction of, exotic invasive plant species on Base in order to minimize adverse economic, ecological, and human health impacts.

Priority Planned Actions:

- Provide focused training for the natural resources staff member(s) responsible for exotic plant species control. Ongoing.
- Reduce or eradicate exotic vegetation from riparian areas and temporarily disturbed sites on Camp Pendleton in accordance with the Riparian Ecosystem Conservation Plan and the Riparian BO. Ongoing. [Also applies to Section 4.3.4.] [Compliance requirement of Riparian BO (T&C, p. 33; Appx 5, p. 3)]
- Continue exotic plant site identification, monitoring, and control efforts in upland habitats to ensure a low reintroduction rate. Ongoing. [Also applies to Section 4.2.2, third objective.]
- Map the spread of exotic plants and successful removal by control programs, including regional data when possible. Ongoing. [Also applies to Sections 4.2.2, third objective; 4.2.3; 4.8.] [Compliance requirement of Riparian BO (T&C, p. 35; Appx 4-tracking community distribution/value, habitat status)]
- Conduct control measures on exotic, invasive species that have a potential direct or indirect adverse impact on federally listed species or their habitat. Ongoing. [Also applies to Sections 4.5.4; 4.6.2.] [Compliance requirement of Riparian BO (Appx 1, p. 79)]
- Aggressively control artichoke thistle in all known locations of reinfestation on Base. Ongoing.
- Where feasible and practical, use native seed stock in restoration and enhancement measures. Ongoing. [Also applies to Sections 4.5.4; 4.7.2, second objective.]

- Where possible use native seed stock if conducting post-fire reseeding. Ongoing. [Also applies to Sections 4.7.2, second objective; 4.11.3.]
- Discourage the use of invasive exotic plants for landscaping, such as those listed by the Exotic Pest Plant Council and the California Native Plant Society. Ongoing. [Also applies to Section 4.8.]
- Annually, review the Base's Exterior Architecture Plan to help ensure that the use of native plant species is maximized in landscaping practices. Ongoing.
- Participate in regional forums and planning initiatives for the removal of invasive, exotic species. Ongoing. [Also applies to Sections 4.1.2, second objective; 4.6.2.]
- Educate Base community members and visitors concerning the potential adverse impacts of exotic invasive species, especially where such promotion may help prevent the introduction and spread of these species. Ongoing. [Also applies to Section 4.6.2.]
- Exercise vigilance for the potential introduction of a new invasive, exotic species and, should such an introduction occur, pursue timely and aggressive control measures to prevent establishment on Base. Ongoing. [Also applies to Section 4.6.2.]
- Establish test plots to understand best management practices for natural resource recovery after wildland fire impacts. Ongoing. [Also applies to Sections 4.5.3; 4.7.2, first objective; 4.11.3.]
- Develop an Exotic/Invasive Species Management Plan for MCAS. 2002. [Also applies to Section 4.6.2.]
- Beginning in 2003, initiate control efforts for fennel per the Listed Upland Species Management Program and its BO. 2003.
- Develop a research plan for the management and monitoring of exotic plant species. 2003.
- Develop a Base Exotic/Invasive Species Management Plan for the Base that is consistent with the National Invasive Species Management Plan (Executive Order 13112). 2003. [Also applies to Section 4.6.2.]

Other Planned Action:

- Evaluate alternative tamarisk control methods than those described in the Riparian Ecosystem Conservation Plan and the Riparian and Estuarine/Beach Biological Assessment. *

4.6.2 Exotic Animals

As with exotic plants, exotic animals may also pose a threat to native species and communities on Base for similar reasons (e.g., competitively excluding native species, altering the habitat in a manner which favors other exotics, predation, nest parasitism, etc.). Currently, the Base is conducting control efforts on several nonnative invasive animals, including the beaver (*Castor canadensis*), brown-headed cowbird (*Molothrus ater*), bullfrog (*Rana catesbiana*), red swamp crayfish (*Procambarus clarkii*), and several exotic fish species (e.g., mosquitofish [*Gambusia affinis*], carp [*Cyprinus carpio*], black bullhead [*Ameiurus melas*], and green sunfish [*Lepomis cyanellus*]). Several potential exotic wildlife species may be candidates for control efforts in the future, including: feral pigs, fire ants, Argentine ants, Africanized honeybees, and feral dogs and cats.

OBJECTIVE: Endeavor to control the spread, and prevent the introduction of, exotic invasive animal species on Base in order to minimize adverse economic, ecological, and human health impacts.

Priority Planned Actions:

- Annually conduct and track (inventory) animal damage control, predator management, and cowbird control activities on Base. Ongoing. [Also applies to Sections 4.2.2, third objective; 4.4.2, first objective; 4.4.3, first objective.] [Compliance requirement of Riparian BO (Appx 4, p. 2)]
- Provide focused training for the natural resources staff member(s) responsible for exotic animal species control. Ongoing.
- Conduct control measures on exotic, invasive species that have a potential direct or indirect adverse impact on federally listed species or their habitat. Ongoing. [Also applies to Sections 4.5.4; 4.6.1.] [Compliance requirement of Riparian BO (Appx 1, p. 79)]
- Continue to implement the plan for the control of exotic fish populations in selected areas of the Base to enhance populations of endangered fish and amphibian species. Ongoing.
- Per the Riparian Ecosystem Conservation Plan and its Biological Opinion, conduct brown-headed cowbird trapping to reduce nest parasitism from this exotic species and to help increase the reproductive success of native bird species. Ongoing. [Also applies to Section 4.4.2, second objective.]
- Educate Base community members and visitors concerning the potential adverse impacts of exotic invasive species, to help prevent the introduction and spread of these species. Ongoing. [Also applies to Section 4.6.1.]

- Exercise vigilance for the potential introduction of a new invasive, exotic species and, should such an introduction occur, pursue timely and aggressive control measures to prevent establishment on Base. Ongoing. [Also applies to Section 4.6.1.]
- Participate in regional forums and planning initiatives for the removal of invasive, exotic species. Ongoing. [Also applies to Sections 4.1.2, second objective; 4.6.1.]
- Develop an Exotic/Invasive Species Management Plan for MCAS. 2002. [Also applies to Section 4.6.1.]
- Develop a Base Exotic/Invasive Species Management Plan for the Base that is consistent with the National Invasive Species Management Plan (Executive Order 13112). 2003. [Also applies to Section 4.6.1.]
- Undertake measures to assess threats to the survival and recovery of the tidewater goby and arroyo toad on Base, including the severity of threats posed by green sunfish, bullfrog, steelhead trout and other likely predators/competitors and hydro modification. 2005. [Also applies to Sections 4.5.3; 4.5.4.] [Compliance requirement of Riparian BO (T&C, p. 35)]
- Undertake measures to assess threats to the survival and recovery of the pacific pocket mouse on Base, including the severity of threats posed by likely predators/competitors. 2006. [Also applies to Sections 4.5.3; 4.5.4.]
- Undertake measures to assess threats to the survival and recovery of the Stephens' kangaroo rat on Base, including the severity of threats posed by likely predators/competitors. 2006. [Also applies to Sections 4.5.3; 4.5.4.]

Other Planned Actions:

- Establish Camp Pendleton's carrying capacity for bison and develop a bison management plan. ***
- Assess the feasibility of halting the introduction of mosquito fish into waters on Base for the control of mosquitoes. **

4.7 WATERSHED MANAGEMENT

The natural pattern of water flow has been significantly altered on Camp Pendleton over the last century. In some cases, altered flows have led to increased soil erosion. The impacts that this alteration may have on riparian cover and diversity, nonpoint source pollution, and water supply have yet to be described. Additionally, the flows entering the Base have been altered significantly by human development in the Santa Margarita and San Mateo watersheds. Since

the Base sits at the bottom of several watersheds, it has an interest in every activity upstream that affects flow and water quality.

Watershed protection activities on Camp Pendleton primarily involve water quality protection and erosion control. These are achieved through nonpoint source pollution control (including storm water, wastewater, nonpoint source pollution, etc.), fire management, vegetation management, and land use management. Erosion and water quality management on Camp Pendleton is in accordance with the best management practices (BMPs) approved by the State of California under the Nonpoint Source Pollution Control Plan and the Phase II Municipal Storm Water Permit.

Camp Pendleton seeks to implement the “Clean Water Action Plan: Restoring and Protecting America’s Waters” and the Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management (65 Federal Register 62565-62572, October 18, 2000). Furthermore, as required by Executive Order 11988, May 24, 1977 and 2000 (Unified Policy on Watershed Management Initiatives) the Marine Corps, when feasible, avoids direct or indirect development of floodplains and restores and preserves the natural and beneficial values served by floodplains. Marine Corps installations are required to evaluate the potential effects of actions in floodplains in order to provide an early opportunity for public review of proposals in floodplains according to NEPA procedures. Camp Pendleton also complies with the Watershed Management Approach chapter of the San Diego Regional Water Quality Control Board’s Basin Plan.

Many watershed issues cannot be addressed by the Base alone, but require Camp Pendleton to participate in cooperative planning and management efforts. These issues include water supply, water quality, wastewater management, aquatic habitat protection, flood protection, and floodplain management. To address these issues effectively requires the Base to coordinate with surrounding jurisdictions during infrastructure and land use development planning and approval processes. Camp Pendleton takes a leadership role within the Santa Margarita River watershed in promoting the watershed approach, and intends to take a similar approach in the San Mateo Creek watershed as urbanization increases.

In 1992-94, Camp Pendleton and Riverside County participated in an effort to improve cooperative land use and water resources planning within the Santa Margarita River watershed. The two Riverside County supervisors whose districts are in the watershed formed a committee with one San Diego County supervisor and representatives of the Cities of Murrieta and Temecula and Camp Pendleton. Technical sub-committees, addressing water supply, water quality, habitat, recreation, flood protection, and land use were formed to advise the committee. The initiative was supported by grants from U.S. Environmental Protection Agency and the California Coastal Conservancy. Its intent was to improve the quality of information provided to land use decision makers about the effects of their decisions at the watershed scale. In the aftermath of devastating flooding in the Santa Margarita River watershed in 1993, the initiative became highly politicized and ultimately bogged down and the group stopped meeting.

Camp Pendleton is currently seeking to establish an alternative forum or mechanism to accomplish the original goals of this initiative, and has facilitated regional discussion groups

on water supply and water quality. Camp Pendleton is participating as a member of the Murrieta Creek Advisory Committee with regard to a major flood control and environmental restoration project being developed by the Army Corps of Engineers in the upper watershed. Most recently, Camp Pendleton became a partner with San Diego County, the U.S. Bureau of Reclamation, San Diego State University, and other stakeholders in a proposal seeking a state grant for watershed plan development, which the Base hopes to integrate with Riverside County's other comprehensive planning efforts.

GOAL: Incorporate best management practices into watershed and habitat protection programs to conserve and enhance native fauna and flora and the functional value of natural systems.

GOAL: Conserve and manage natural resources in accordance with environmental laws and their implementing regulations.

GOAL: Manage vegetative cover, erosion, and fire so areas remain usable and available for amphibious, land, and air based training.

GOAL: Provide fully compliant and reliable water supply and wastewater treatment, good stewardship of all water resources, and leadership in watershed management.

4.7.1 Water Resources Management

Water is a scarce and limiting resource in southern California. While the majority of water districts in southern California are forced to import water from hundreds of miles away from the Sacramento Delta and the Colorado River, Camp Pendleton has managed its water supply to provide for all of its water demands through local groundwater sources within four main basins on Base. Protection of this critical resource is essential to the continued ability of the Base to accomplish its mission.

Water resources issues include water rights, water supply, water quality, wastewater, stormwater, flood prevention, and watershed management. The Base works actively to protect its water resources from quality, quantity, and legal threats. Camp Pendleton protects the adequacy of its water supply by implementing conservation programs and by defending its adjudicated water rights through technical, administrative, and legal mechanisms. The Base protects the quality of the water through pollution prevention programs, wellhead protection and treatment, and active involvement in watershed based pollution control programs. Marine Corps Base, Camp Pendleton is committed to providing high quality water to Base consumers. The facilities, environmental, and legal staffs on Base, share Camp Pendleton responsibilities for water quality management with the goal to ensure that current and future demands are met in accordance with mission and quality of life requirements.

The Base Water Steering Committee (BWSC), which is composed of designated staff from the AC/S Facilities, AC/S Environmental Security, AC/S MCCS, MCAS, and Western Area Counsel Office, meets regularly to effect coordination and strategic planning of Base water

resources. Water related issues this group meets to discuss range from flood protection requirements and upgrades/repairs to existing water and wastewater facilities. This group also has been instrumental in the development of future infrastructure upgrades and broad scope objectives to ensure competency and compliant program management.

The Base Water Steering Committee is responsible for the implementation of the Strategic Water Plan (SWP). This Plan states the Base's strategic vision for water resources and identifies and proposes strategies to achieve that vision (a majority of the objectives and planned actions within this section were derived from the SWP). The committee members are responsible to the BWSC for adherence to, and implementation of, the SWP by the organizations that they represent on the committee. The BWSC does not have direct authority over the staff sections, offices and departments represented on the BWSC, but the BWSC tracks implementation of the SWP at regular quarterly meetings.

OBJECTIVE: Maintain water supply independence by (1) maximizing development of local water sources, (2) preserving/developing alternative water sources, (3) optimizing wastewater recycling, and (4) meeting all mandated water conservation goals.

Priority Planned Actions:

- Evaluate the feasibility of participating in cooperative watershed restoration programs, including cooperating with local governmental and nongovernmental stakeholders. Ongoing. [Also applies to Sections 4.1.2, second objective; 4.3.1, first objective; 4.5.4.]
- Settle litigation with Rancho California Water District to guarantee adequate quantity, quality, and variability of stream flow in Santa Margarita River. 2002.
- Settle litigation with Fallbrook Public Utility District to optimize development of the Base's groundwater basins and supersede 1968 Memorandum of Agreement. 2002.
- Develop an agreement within the Santa Margarita Watershed to account for water conservation regionally. 2002.
- Develop plans to optimize development of the San Mateo Basin. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval. 2003.
- Develop Permit 15000 and seek license. 2007.
- Develop plans to establish operational link between North and South water systems. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval. 2008.

Other Planned Actions:

- Develop plans to establish operational connections of the North and South water systems to off-Base water with capacity to meet 100% of emergency requirements. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval. ***
- Execute renegotiated Four Party Agreement to maximize the benefits of live stream discharge of treated sewage effluent. ***
- Beneficially reuse 70% of dry weather treated sewage effluent in the South water system. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval. **
- Beneficially reuse 70% of dry weather treated sewage effluent in the North water system. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval. *

OBJECTIVE: Provide leadership in watershed management.

Priority Planned Actions:

- Lead the Santa Margarita River Watershed Water Quality Monitoring Group to develop and propose a coordinated watershed-wide water quality monitoring plan. 2002.
- In partnership with The Nature Conservancy and San Diego State University, develop and implement a long-term monitoring program to measure and correlate flow, sediment transport, water chemistry, and habitat in the lower Santa Margarita River watershed. 2002.

OBJECTIVE: Manage stormwater to optimize resources and comply fully with laws and regulations.

Priority Planned Actions:

- Prepare draft Phase II Municipal Stormwater Permit Application and compliance plan. 2003.

Other Planned Action:

- Participate in the Santa Margarita River watershed stormwater permit-holder committee. ***

OBJECTIVE: Ensure protection of Base assets.

Priority Planned Actions:

- Develop plans to ensure 100-year flood protection of all new facilities. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval. Ongoing.
- Complete Phase III Early Warning System improvements. 2003.
- Execute agreements to use cooperative management of upstream hydrology to ensure 200-year flood protection of MCAS Camp Pendleton, and the Ranch House. 2004.

OBJECTIVE: Ensure that all Base planning programs consider effects on, and limitations of, water resources and infrastructure.

Priority Planned Actions:

- Make water resources and water infrastructure decisions based on planning that considers all aspects of water resources issues, including current and projected operational and regulatory requirements. Ongoing.
- Improve the data collected, used for, and provided by water resources planning. Ongoing.

OBJECTIVE: Ensure the adequate supply and reliable delivery of safe water to support consumptive and environmental requirements of the Base. Use best management practices to minimize nonpoint sources of water pollution. (U.S. DoD 1996)

Priority Planned Actions:

- Continue to monitor tide levels and water quality in the Santa Margarita River; evaluate potential changes to the estuarine ecosystem as a result of ongoing actions and projects and document the periods when the other coastal lagoons are subject to tidal influence. Ongoing. [Also applies to Sections 4.2.3; 4.3.3.] [Compliance requirement of Riparian BO (T&C, Appx 4, p. 2)]

- Continue groundwater monitoring in all drainages where groundwater is extracted to determine and manage the potential effect on listed species habitat. Ongoing. [Also applies to Section 4.2.3.] [Compliance requirement of Riparian BO (T&C, Appx 4, p.1)]
- Monitor stream water quality, flood regimes, and storm event frequency. Ongoing. [Also applies to Section 4.2.3.] [Compliance requirement of Riparian BO (T&C, Appx 4, p.1)]
- Monitor the effects of sedimentation in Santa Margarita River Estuary and coastal lagoons that are subject to upstream disturbance from programmatic, construction activities, and off Base activities. Ongoing. [Also applies to Sections 4.3.3; 4.7.2, first objective.] [Compliance requirement of Riparian BO (Appx 4, p.2)]

4.7.2 General Vegetation Management and Soil Conservation

Watershed, floodplain, fuel break/fire management, prescribed burning, grounds maintenance, landscaping, and erosion control can all be viewed as components of vegetation management and soil conservation. Meeting the objectives of each of these components requires an integrated approach to vegetation management as well as the other natural resources components identified in this chapter. Legislation and regulations relevant to vegetation management and soil conservation are summarized in Appendix B.

In 1990, in response to anecdotal reports of erosion problems (provided by Marines, Fire Department personnel, FMD, AC/S ES staff, contractors, researchers, etc.), Camp Pendleton began a systematic review of training lands to identify locations on Base experiencing erosion. Since then, the Base has expended substantial time, effort, and funds in an attempt to adequately identify, monitor, and address erosion problems basewide. As part of its commitment to managing natural resources and as partial compensation for temporary impacts incurred from training and other activities across the Base, Camp Pendleton plans to implement a formal erosion control program.

Erosion of the sea cliffs, bluffs, and canyon heads along Camp Pendleton's shoreline is catastrophic, episodic, site specific, and directly related to prevailing meteorological conditions and, in recent years, to anthropogenic alterations of natural drainage patterns (Khun 1999). To address the problem of erosion on Camp Pendleton along the San Onofre State Beach, Kuhn (1999) documented the landslide movement between old Highway 101 and the shoreline since 1980 and the storm water runoff effects as a result of natural and anthropogenic diversions such as roads; railroad installations; agricultural, military, and camping operations; fires; seismic activity; and high rainfall. This study provided valuable insight into the history of the erosion problem, the cumulative effects, and the severity of the problem on a site specific basis within the study area. Recommendations for future management actions were also provided.

An erosion site database was developed in 1997 to prioritize limited resources and focus on areas where erosion repair was feasible. This field inventory identified approximately 130 locations where potential erosion problems exist. Several of the projects have already been started (Table 4-3). At present, erosion control activities are focused on specific sites. An Erosion Management Plan is being developed as the first phase of programmatic erosion control measures.

TABLE 4-3. Recent (since 1997) erosion control projects conducted or proposed on Base.

Date	Project	Location	Contractor	Status
1999	Training lands reclamation	To be determined	Claude Boehm	Ongoing
1999	DZ tank park	DZ tank park	Resource Conservation District (RCD)	Completed 1999
1998	Erosion control plan	Basewide	Tierra Data	Draft submitted 11/1999
1998	Coastal canyons	Coastal canyons	RCD	Ongoing
1998	DZ tank park	DZ tank park	RCD	Ongoing
1998	Bluff erosion study	North of White Beach	Gerry Kuhn	Completed 1999
1997	DZ tank park	DZ tank park	RCD	Ongoing

Implementation of the Erosion Management Plan is expected to directly benefit natural resources through: (1) the reduction of soil erosion and subsequent sedimentation at adjacent habitats, streams, and drainages; (2) enhanced vegetative recovery on site; (3) potential expansion of habitats for natives species; and (4) exotic pest plant reduction and control.

OBJECTIVE: Protect and restore soil productivity, watershed functioning, water quality, and wildlife habitat through effective implementation of best management practices to prevent and/or control soil erosion.

Priority Planned Actions:

- Provide focused training for the natural resources staff member(s) responsible for soil conservation and erosion control. Ongoing.

- Establish test plots to understand best management practices for natural resource recovery after wildland fire impacts. Ongoing. [Also applies to Sections 4.5.3; 4.6.1; 4.11.3.]
- In the preliminary engineering design and construction of facilities involving ground disturbance, incorporate soil and water conservation and native vegetation landscaping, as appropriate, per the White House Memorandum for the Heads of Executive Departments and Agencies (26 April 1994) and Executive Order 13112 (3 February 1999). Ongoing. [Also applies to Section 4.8.] [Compliance requirement of Riparian BO (Appx 1, pp. 70, 87; Appx 5, p. 3)]
- Monitor the effects of sedimentation in Santa Margarita River Estuary and coastal lagoons that are subject to upstream disturbance from programmatic, construction activities, and off Base activities. Ongoing. [Also applies to Sections 4.3.3; 4.7.1, sixth objective.] [Compliance requirement of Riparian BO (Appx 4, p.2)]
- When row crop outgrants come up for renewal, review Soil and Water Conservation plans for compliance with all applicable natural resource requirements. Ongoing. [Also applies to Section 4.10.2.]
- Review damage caused by unauthorized off road travel and incorporate into planned restoration efforts and routine maintenance. Ongoing. [Also applies to Section 5.4.]
- Establish a Natural Resource Damage Repair program by 2003. Implement repair actions as needed in a timely manner. 2003.
- Complete development of research based specifications and standards for reseedling/revegetation of disturbed sites. 2002.
- In collaboration with Camp Pendleton land users, federal, state, tribal, local governments, nongovernmental organizations, private organizations, and the public develop a shared vision of what constitutes desirable future watershed conditions for the Santa Margarita River and the San Mateo Creek. 2003. [Also applies to Section 4.1.1, first objective; 4.1.2, first objective.]

Other Planned Actions:

- Restore and enhance coastal dunes. [Also applies to Sections 4.3.3; 4.7.2, second objective.] ***
- Reduce encroaching bluff erosion. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval. [Also applies to Sections 4.3.3; 4.7.2, second objective.] **

- Monitor the effects of off road vehicle use and provide for the rehabilitation of training lands that have excessive degradation. [Also applies to Section 4.2.3.] **

OBJECTIVE: Implement an Erosion Control Management Plan.

Priority Planned Actions:

- Annually evaluate the prioritization of erosion control sites and apply best management practices to control measures for areas of severe gullying to decrease hazardous training conditions. Ongoing.
- Apply best management practices to erosion control measures for firebreaks and roads basewide. Ongoing.
- Where feasible and practical, use native seed stock in restoration and enhancement measures. Ongoing. [Also applies to Sections 4.5.4; 4.6.1.]
- Where possible use native seed stock if conducting post-fire reseedling. Ongoing. [Also applies to Sections 4.6.1; 4.11.3.]
- Complete the Erosion Control Management Plan. 2003.

Other Planned Actions:

- Restore and enhance coastal dunes. [Also applies to Sections 4.3.3; 4.7.2, first objective.] ***
- Reduce encroaching bluff erosion. Submit specific projects through normal Base staffing procedures and the Base NEPA process for decision and approval. [Also applies to Sections 4.3.3; 4.7.2, first objective.] **

4.8 GROUNDS MAINTENANCE AND LANDSCAPING

Grounds maintenance and landscaping includes considerations for weed control and urban forestry. It is Marine Corps policy that environmentally and economically beneficial landscaping practices be used. These practices are outlined in a Memorandum for Heads of Executive Departments and Agencies issued by the President (Presidential Memorandum) dated 26 April 1994. The Presidential Memorandum directs federal agencies to use landscaping techniques that enhance the local environment and minimize the adverse effects that landscaping can have on the environment. The Presidential Memorandum stresses use of regionally native plants and practices that conserve water and prevent pollution. Integrated measures include reducing use of fertilizers, pesticides, and water use for both economic and

environmental benefits. With regard to the control of noxious weeds, Marine Corps installations will cooperate with state programs for controlling noxious plants. Camp Pendleton allows access for that control, consistent with installation safety and security considerations and when similar control measures have been followed on privately owned lands. Grounds maintenance activities are integrated with fire management with respect to clearing around buildings.

Many locations at Camp Pendleton have species protected by the Endangered Species Act, including areas in the immediate vicinity of developed and landscaped areas. To help ensure compatibility with federally listed species and natural resource management in general, the Base Exterior and Architecture Plan contains a list of approved plants that may be used for landscaping on Base. Changes to this list are reviewed by the Resource Management Division to ensure consistency with the Base's exotic species control program.

Prior to clearing natural vegetation, AC/S ES (Environmental Officer for the Air Station) is consulted with for natural resources impacts. During the breeding season site surveys are required to locate active bird nests that are removed only after obtaining required permits and/or "take" authorization from the USFWS. Pesticide application must be coordinated with the Base pesticide coordinator and should be part of an integrated pest management approach. Mowing around runways and parking aprons is done with consideration that federally listed and sensitive species are in the immediate vicinity of the runways.

GOAL: Develop and implement a Native Landscaping Plan

GOAL: Ensure that grounds maintenance and landscaping operations are integrated and consistent with natural resource goals and objectives.

OBJECTIVE: Provide a plan for management and expansion of community landscapes on Base. Conserve water, protect water quality, reduce runoff and erosion, and decrease plant nutrient loss by reducing the demand for water in landscaping. Promote use of native species in landscaping practices.

Priority Planned Actions:

- Map the spread of exotic plants and successful removal by control programs, including regional data when possible. Ongoing. [Also applies to Sections 4.2.2, third objective; 4.2.3; 4.6.1.] [Compliance requirement of Riparian BO (T&C, p. 35; Appx 4- tracking community distribution/value, habitat status)]
- Discourage the use of invasive exotic plants for landscaping, such as those listed by the Exotic Pest Plant Council and the California Native Plant Society. Ongoing. [Also applies to Section 4.6.1.]

- Review annually and recommend changes to the Base landscaping plans for compliance with the White House Memorandum for the Heads of Executive Departments and Agencies (26 April 1994) and Executive Order 13112 (3 February 1999). Ongoing.
- In the preliminary engineering design and construction of facilities involving ground disturbance, incorporate soil and water conservation and native vegetation landscaping, as appropriate, per the White House Memorandum for the Heads of Executive Departments and Agencies (26 April 1994) and Executive Order 13112 (3 February 1999). Ongoing. [Also applies to Section 4.7.2, first objective.] [Compliance requirement of Riparian BO (Appx 1, pp. 70, 87; Appx 5, p. 3)]
- Use the exotic plant control program to control spread of exotic landscaping plants into natural areas. Ongoing.
- Review and revise the flightline mowing program Standard Operating Procedures to maintain consistency with BASH program. 2003.

4.9 COMMERCIAL FORESTRY – N/A at Camp Pendleton

4.10 GRAZING AND AGRICULTURAL OUTLEASES

AC/S Environmental Security is responsible for overseeing agricultural, grazing, and seed collecting outleases. These programs are consistent with the multiple use concept adopted by the Marine Corps for its lands. The leases benefit the Marine Corps by providing sound and appropriate land uses, along with income to the Base. The agricultural outlease program has operated successfully for many years. The success is due partly to deep soils, the mild coastal climate, and access to water. Proximity to urban markets also provides for the economic success of these enterprises.

Each agricultural outlease contains a Soil and Water Conservation Plan specifying practices and projects to be performed by the lessee as part of the contract. It includes specific soil and water conservation practices required to protect and improve the productivity and fertility of the land, a schedule for application of the required practices, and provisions for restoration of the land upon termination of the lease. In addition, each plan includes agricultural and pest management practices that are consistent with state and federal regulatory requirements and the overall goal of the installation. Conservation measures currently include various erosion control projects, irrigation system upgrades, pest management requirements, fire prevention, debris removal, road damage prevention and access policies. Leased parcels are routinely monitored for compliance with the lease documents and erosion specifications.

GOAL: Evaluate the compatibility and fair-market value of the agricultural and grazing leases, in conjunction with the military mission and natural resource management.

4.10.1 Livestock Grazing

The Base leases out approximately 24,000 acres for sheep grazing. The acreage available for grazing is located in active training areas and is used only when grazing will not interfere with military training. The established animal carrying capacity is set at approximately 44,000 sheep-unit months (a sheep-unit month is the amount of forage a single ewe-lamb pair will consume in a month). Grazing is permitted mainly on annual grasslands south of the Santa Margarita River and on perennial grasslands north of the river (Figure 2-9). Grazing is also used for vegetation control within the fenced compound at the Las Pulgas Ammunition Supply Point to maintain vegetation within height limits specified in fire hazard regulations. Sheep have also been used to abate fire hazards on specific ranges).

Associated with the equestrian program on Base are two pastures for horse grazing. The larger pasture is approximately 1,309 acres and covers much of the Lima training area. The small pasture, 123 acres, is adjacent to the stables. These pastures are available for leased grazing. The number of horses and frequency of usage varies from year to year. As the horse grazing is associated with recreational activities, MCCA provides the lead for the management and use of these areas.

OBJECTIVE: Ensure the long term viability, compatibility, and fair-market value of the grazing leases, consistent with the needs of the military mission and natural resource protection.

Priority Planned Actions:

- Evaluate grazing levels (from both sheep grazing leases and horse pasture usage) to ensure resource sustainability and minimal adverse impacts to training, Base operations, and federally listed threatened and endangered species. Ongoing.
- Monitor the number and class of animal permitted to graze under lease agreements on Base. Ongoing.
- Ensure all present and future Base Orders address the activities of outgrantees, including row crop and grazing leases, as appropriate. Ongoing. [Also applies to Section 4.10.2.]
- Evaluate horse grazing and prepare a plan to ensure the sustainability of the resources and the avoidance and minimization of adverse impacts to federally listed species. 2003. [Also applies to Section 5.3.3.]
- Develop a Grazing Management Plan. 2003.

- Develop a Standard Operating Procedure addressing specific environmental compliance actions required by all outgrantees, including row crops, issued aboard Camp Pendleton. 2005. [Also applies to Sections 4.10.2; 4.10.3.]

4.10.2 Row Crop Production

Approximately 1,400 acres of land on Base are leased out for farming. Agricultural leases are typically for 5 year. In accordance with the Soil and Water Resources Conservation Act of 1977, each agricultural outlease must have a Soil and Water Conservation Plan specifying practices and projects to be performed by the lessee as part of the contract. Conservation measures currently include erosion control projects, irrigation system upgrades, pest management requirements, fire prevention, debris removal, road damage prevention, and access policies. Each lease also specifies soil and water conservation practices required to protect and improve land productivity and fertility, a schedule for application of the required practices, and provisions for restoration of the land upon termination of the lease. Additionally, each plan includes agricultural and pest management practices that are consistent with state and federal regulatory requirements and the overall goals of the Base.

Funds from agricultural leases can only be used for administrative support of agricultural leases and financing multiple land use management programs. These funds are specifically restricted from being utilized for mitigation funding and funding of non-land management staff at Camp Pendleton. These funds are traditionally used for erosion control efforts, the long term trend monitoring program, rare plant surveys, natural resource staff positions, etc.

OBJECTIVE: Ensure the long term viability, compatibility, and fair-market value of the row crop leases, consistent with needs of the military mission and natural resource protection.

Priority Planned Actions:

- When row crop outgrants come up for renewal, review Soil and Water Conservation plans for compliance with all applicable natural resource requirements. Ongoing. [Also applies to Section 4.7.2, first objective.]
- Provide periodic inspection of all outgrants, including row crops, and implement an effective action plan to address any violations. Ongoing.
- Ensure all present and future Base Orders will address the activities of outgrantees, including row crop and grazing leases, as appropriate. Ongoing. [Also applies to Section 4.10.1.]
- Evaluate row crop activities on Base to ensure they are properly integrated with natural resource management efforts. 2002.

- Expand the Base's Environmental Compliance Evaluation process to include all real estate tenants aboard Camp Pendleton. 2003.
- Develop a Standard Operating Procedure addressing specific environmental compliance actions required by all outgrantees, including row crops, issued aboard Camp Pendleton. 2005. [Also applies to Sections 4.10.1; 4.10.3.]

4.10.3 Native Seed Collection

An undetermined amount of land is available for native seed harvesting. Private contractors have commercially harvested seeds from native plants on Camp Pendleton since 1988. Native seeds have commercial value as stock for native vegetation restoration programs and for ornamental landscaping. In addition to gaining revenue from the commercial sale of the seeds, seeds are reserved for Camp Pendleton to use for restoration purposes. The use of seeds from the Base helps ensure a genetic stock that is adapted to the environmental conditions of the area and reduces site restoration costs.

Over 200 species are approved for harvest with a species list provided to the contractor. No more than 30% of the annual seed crop of any tree, brush, forb, or grass species in any individual location is harvested each year. All seed harvesting is done by hand and/or with hand carried vacuum type devices. Mechanical harvesting is not allowed. No mechanical injury to plants is allowed. The harvesting of threatened, endangered, or proposed threatened/endangered species is regulated by the U.S. Fish and Wildlife Service and by Base policy.

OBJECTIVE: Ensure the long term viability, compatibility, and fair-market value of the seed collection leases, in conjunction with the military mission and natural resource protection.

Priority Planned Actions:

- Provide appropriate oversight to native seed collection efforts on Base. Ongoing.
- Develop a Standard Operating Procedure addressing specific environmental compliance actions required by all outgrantees, including row crops, issued aboard Camp Pendleton. 2005. [Also applies to Sections 4.10.1; 4.10.2.]

Other Planned Action:

- Conduct study to ensure that current seed collection methodologies do not impact natural resources on Base. *

4.11 FIRE MANAGEMENT

The overriding goal of fire management on Base is to: “Protect life, property, and natural ecosystem functioning and diversity, while maximizing training opportunities and minimizing total cost” (MCB Camp Pendleton 1998). The high fire ignition frequency at Camp Pendleton (Minnich 1983) likely represents the single greatest influence on natural resources on Base (MCB Camp Pendleton 1998). The frequency is influenced by three factors: (1) frequent ignition sources from weapons firing, explosions, and pyrotechnic devices; (2) biological and climatic conditions conducive to fire in the late summer and fall; and (3) large areas of open space with abundant extremely dry vegetation.

To address fire management issues, Base Order P11320.13D (*Fire Protection Regulations and Instructions*) was implemented in 1992. Subsequently a Fire Management Plan (FMP) was developed. An update of the FMP (entitled *Wildland Fire Management Plan Update*, MCB Camp Pendleton 1998), developed jointly with the USFWS, was recently completed. The FMP is based on the development, implementation, and oversight of a proactive strategy focused on valuation and prioritization of Base resources. The 1998 FMP strategy seeks to balance military training requirements with protection of natural resources, in combination with fiscal considerations.

Wildland fire on Camp Pendleton is a continual challenge to land managers and firefighters, especially in the context of many sensitive and federally protected natural resources. As part of the adaptive management foundation for the Wildland Fire Management Plan (MCB Camp Pendleton 1998), a follow-up program of field studies (Fire Studies program) was designed to address data gaps and to validate and support recommended management strategies associated with the effects of wildland fire on sensitive natural resources. Examples of some of the strategies recommended in the Wildland Fire Management Plan that were recently investigated in the Fire Studies program included: (1) controlling patch size and maximizing edge habitats; (2) maximizing seed banks of native, fire-following annuals by reducing the fire frequency and intensity; (3) buffering riparian drainages from excessive fire frequency and nonpoint source pollution; and (4) improving age class structure of shrub communities. Research conducted from 1997 to 2000 by Tierra Data Systems (MCB Camp Pendleton 2001) has contributed to the Fire Studies program.

Camp Pendleton’s Fire Department is actively engaged in regional planning and partnering to the mutual benefit of the Base and local, regional, and national agencies. In addition to providing personnel and equipment to assist in emergency wildfires throughout the region, Fire Department staff regularly provide professional expertise in fire management planning and in personnel training. The following examples highlight some of the ways in which the Camp Pendleton Fire Department has contributed to, or is involved in, local, regional, and national partnering efforts:

- Federal Wildland Fire Policy Review Working Group and the National Wildfire Coordinating Group. Camp Pendleton’s Fire Chief acts as the DoD representative to the Federal Wildland Fire Policy Review Working Group and the National Wildfire Coordinating Group, which were established to develop and implement fire management policy for use on all federal lands.

- Wildland Fire Suppression Training Support. Camp Pendleton's Fire Department annually host two weeks of wildland fire suppression training for US Forest Service personnel and all other regional cooperating agencies.
- Wildland Fire Suppression Mutual Aid Agreements. Camp Pendleton's Fire Department provides personnel and equipment, as available, as part of mutual aid agreements with local, regional and national with members, as part of Interagency Incident Management Teams. Camp Pendleton's Fire Chief was an Incident Commander in Los Alamos, New Mexico Fire (*Cerro Grande Incident*) during May and June 2000.
- Camp Pendleton's Fire Management Plan. Camp Pendleton's Fire Management Plan was developed in cooperation with the USFWS and is being viewed by several DoD installations and National Forests as a potential regional model.
- Naval Weapons Station Fire Management Plan. Camp Pendleton's Fire Department is currently assisting Naval Weapons Station, Seal Beach Annex personnel (and their contractors) in development of a Fire Management Plan that is complementary to Camp Pendleton's new Fire Management Plan and strategy.
- Santa Ana Mountains Fire Alliance and the San Diego County Fire Safe Council. Camp Pendleton's Fire Department is a member of the Santa Ana Mountains Fire Alliance and the San Diego County Fire Safe Council.
- San Diego County Fire Service Working Groups. Camp Pendleton's Fire Department personnel are active around San Diego County in several fire service working groups to help ensure the availability of, and ready access to, up-to-date information on fire incidents and fire-related land management issues on Base.
- Regional Fuels Management and Fire Resource Allocation Planning. Camp Pendleton's Fire Department is working with the Cleveland National Forest and Orange County Fire Authority on fire management issues that integrate both fuels management and fire resource allocation planning.
- Fire Department Local Mutual Aid Memorandum of Understanding. Camp Pendleton's Fire Department has established a MOU with all fire agencies in San Diego County, the Orange County Fire Authority, the California Department of Forestry & Fire Protection, U.S. Forest Service, San Onofre Nuclear Generating Station, Cal Trans, and California Highway Patrol for providing mutual aid, when requested.
- Fire Management Equipment Field Testing and Evaluation. Camp Pendleton lands have been instrumental in the testing and development of the utility and applicability of Type-1 Helicopters (large Heli-tankers) as an initial attack resource on wildfires. The first Type-1 initial attack Helicopters were stationed and tested for three years at

Camp Pendleton. Results of this research has resulted in the placement of initial attack type I helicopters throughout southern California. Camp Pendleton's Fire Department, in conjunction with the program sponsor, California's Department of Forestry and Fire Protection, also hosted and coordinated research and development of the "*Operation Fire Stop II*" project. This joint effort was designed and initiated to test and evaluate new, 21st century wildfire fighting equipment.

GOAL: Implement recommendations from the 1992 plan and incorporate information obtained from the Fire Management Plan Risk Assessment conducted by REM & Associates (1994).

GOAL: Manage fire consistent with training needs and safety.

4.11.1 Pre-Suppression

Conditions that lead to high fire frequencies on Base cannot be eliminated. Therefore, pre-suppression measures are an essential mission support component of the Fire Management Program. Pre-suppression measures include the implementation of the Fire Danger Rating System (FDRS), maintenance of fuel/firebreaks and access roads, and application of controlled burning.

The Fire Danger Rating System consists of a color-coded notification system that indicates the fire danger level and programmatic instructions that identify restrictions on activities with fire generating potential (Table 4-4). Fire danger ratings are established daily from a combination of weather data, fuel load, Base activity level, and fire fighting resource availability. (Ratings may be further adjusted within a given locality for the added protection of sensitive natural resources.) Fire hazard conditions are monitored throughout the day by the Base's Fire Department, in cooperation with Range Control, and through intermittent range inspections.

An essential component of fire prevention on Base is fuels management. The management of fuels can help prevent as well as assist in the control of fires that do start. Pre-suppression fuels management involves the maintenance of firebreaks and fuel breaks to limit or slow the spread of fire. The Base has established an extensive network fire/fuel breaks, totaling nearly 1,300 acres over approximately 186 linear miles.

Another important pre-suppression fuels management measure involves the use of controlled burns. The Fire Department submits an annual burn plan (which includes all controlled burns) for review by the AC/S ES to ensure that these pre-suppression fire management actions are consistent with natural resource management goals and the San Diego County Air Pollution Control District's Smoke Management Program. All controlled and training burns are coordinated with and permitted by the San Diego County Air Pollution Control District.

OBJECTIVE: Minimize the risk of adverse impacts from wildfires and fire management practices.

Priority Planned Actions:

- Provide natural and cultural resource technical services to the Camp Pendleton Fire Department to support their fire management planning efforts. Ongoing. [Also applies to Sections 4.11.2; 4.13.]
- Conduct pre-suppression measures (e.g., controlled and prescribed burning) to help reduce the fuel load while managing for sensitive natural resources. Ongoing.
- Provide wildland fire management training to natural resources staff responsible for supporting wildland fire management on the Base. Ongoing. [Also applies to Sections 4.11.2; 4.11.3.]
- Annually update fuel load hazard mapping. Ongoing. [Also applies to Section 4.2.1.]
- Schedule and prioritize prescribed burns for resource management and fire suppression. Ongoing.
- Identify controlled burn or other brush management areas that will be valuable for maintaining or enhancing mosaic and diversity of vegetative age classes and enhance wildlife diversity. This will compliment the Camp Pendleton Wildland Fire Management Plans and Uplands Ecosystem Conservation Plan. Ongoing. [Also applies to Section 4.4.1.]
- Restore, using best management practices, firebreaks and roads that are no longer needed. Ongoing. [Also applies to Section 4.11.3.]
- Develop a set of programmatic instructions/guidelines in coordination with the Fire Department for use during wildfire suppression activities. 2002. [Also applies to Section 4.11.2.]
- Prepare jointly with the Fire Department, Standard Operating Procedures for annual maintenance of the Base's fuel breaks, firebreaks, and access roads. 2002.
- Validate, and revise where necessary, the current fire model. 2002.
- Evaluate present firebreaks needed to support the Wildland Fire Management Plan. 2002. [Also applies to Section 4.11.3.]
- Develop a fuel loading report that identifies high hazard areas. 2002.

- Develop a GIS based vegetation age class distribution map of the Base that shows levels of fuel loading. 2002. [Also applies to Section 4.2.1.]

TABLE 4-4. Fire Danger Rating System.

Fire Danger Rating	Caution to be Exercised	Necessary Precautions	Hazard
BLUE 0-30	Use normal caution.	Any type of ammunition may be used with care. Smoking is permitted.	LOW
GREEN 31-40	Use normal caution. Fires will start very easily.	Any type of ammunition may be used with care. Smoking is permitted.	MODERATE
YELLOW 41-60	Use extra caution. Fires will start very easily.	Yellow is the beginning of the high danger period. Any type of ammunition may be used on ranges and within impact areas. Smoking is permitted only in cleared areas or on firebreaks. The use of pyrotechnics, demolitions, and heat/flame producing devices within maneuver areas will be limited as much as possible to cleared areas or areas previously burned for that purpose.	HIGH
ORANGE 61-80	Use extreme caution. Fires are very hard to control.	Firing will be permitted at all times on all ranges and within impact areas, unless restricted by the Impact Area Control Officer. Minimal use of pyrotechnics, demolitions, and heat/flame producing devices, including blanks, is allowed within maneuver areas; however, their use is restricted to cleared or previously burned areas only. Smoking is permitted only in cleared areas and on firebreaks.	VERY HIGH
RED 81-100	Flash condition. This is the highest class of fire danger. Fires started are practically impossible to extinguish and usually continue until danger rating conditions improve or they burn themselves out. The utmost caution must be exercised at all times with fire producing agents and devices.	The firing of high explosives, pyrotechnics, incendiaries, or other ammunition likely to cause fires is prohibited unless specifically authorized by the Base Training Facility Officer. Authorized firing units will be advised as to the status of the range or impact area in question by the Impact Area Control Officer should a change in the fire danger rating occur. The Fire Chief can authorize keeping the lower elevation training areas open because of the cooling effect of fog. If kept open, the Fire Chief will enhance Initial Attack capabilities to the area in the event of a wildland fire. Firing units will exercise maximum attention to the observance of range fans and other pertinent precautions to prevent fires of any nature from starting. Smoking will be permitted only under strictly supervised conditions and in fire-safe areas. The use of any type of training/live ordnance, heat or flame producing devices (heaters, welders, stoves, or open fires) in maneuver areas is strictly prohibited.	EXTREME ^a

^a These ranges are closed during extreme rating: Door Gunner 1, Door Gunner 2, 401 Impact Area. These training areas are closed during extreme rating: Juliett, Lima, Hotel, Golf, Romeo One, Alfa Three, Bravo One, Bravo Two, Yankee, Charlie, Delta, Echo, Foxtrot, India, East of India Firebreak and North of West/East Firebreak.

4.11.2 Suppression

Fire suppression occurs throughout the Base as needed, mostly between the months of May and November. Fire suppression activities include: fire line construction, firing out, direct suppression, and “mop-up” activities. Where possible, fire vehicles use existing roads or firebreaks; however, suppression actions may include driving off road, including over burned areas. Past fire patterns (Figure 4-1) indicate the location of the majority of the fire suppression activity on Base.

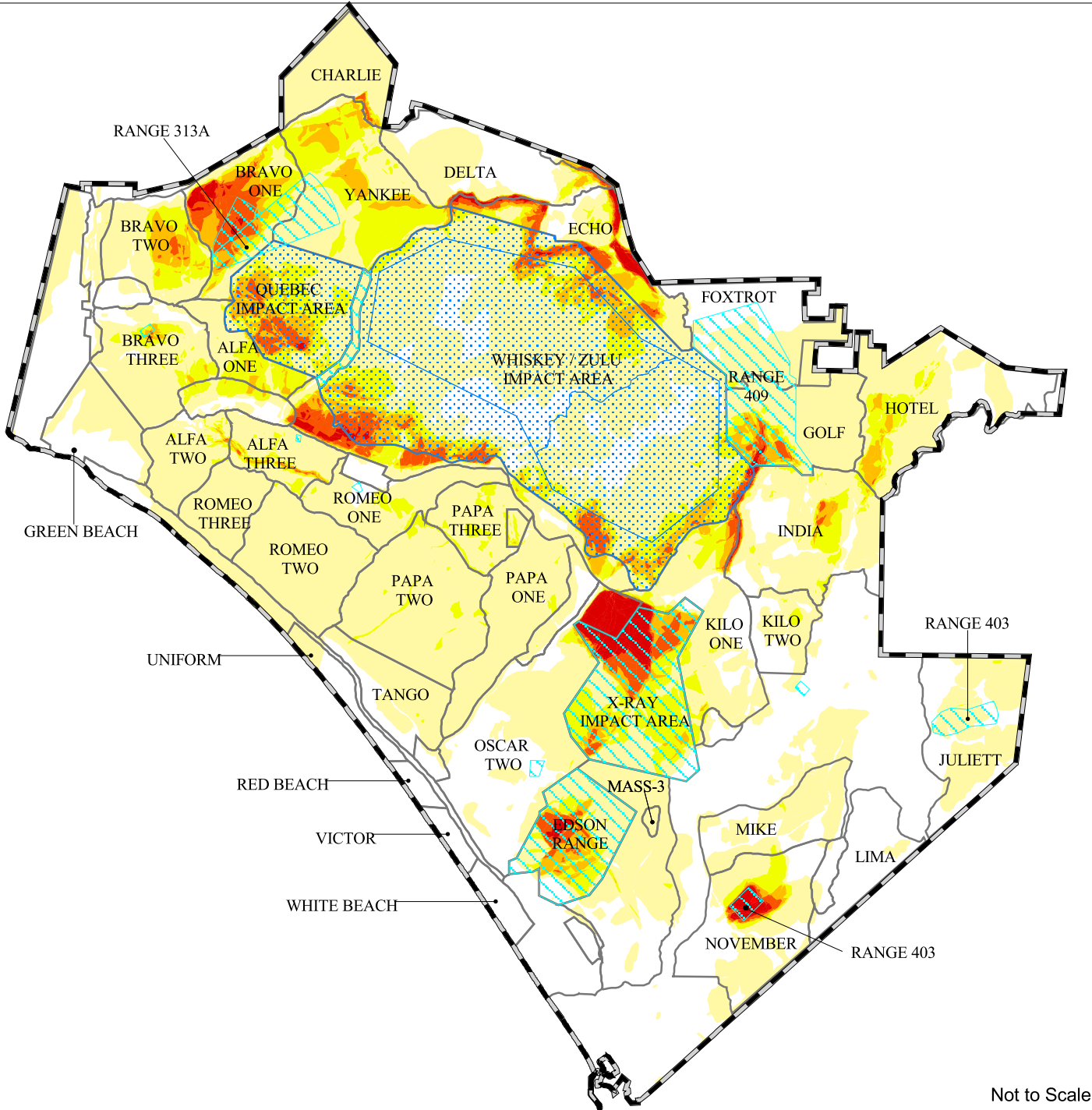
In many cases, existing paved and dirt roadways can be used as fire lines to contain a wildfire. The location of sensitive habitats or listed species is considered in carrying out all forms of fire suppression actions, especially if an area is to be bulldozed or hand cut for a fire line. Personnel from the Fire Department contact the AC/S Environmental Security when sensitive natural resources (as identified on the Base Environmental Operations Map) may be affected by suppression activities. A natural and cultural resource representative from the AC/S Environmental Security Resource Management Division responds to such calls and provides guidance to the Incident Commander on avoidance and minimization of impacts to listed species and occupied habitats. Fires of five acres or larger are mapped.

Fire suppression is conducted on Base using in-house resources with additional cooperative support from local and regional firefighting agencies. In-house firefighting resources include 10 standard wildland firefighting vehicles (5-ton, 6-wheel drive); 10 light attack vehicles (High Mobility Multipurpose Vehicle [HMMV] and/or four-wheel-drive pickup trucks mounted with water tanks); 2 water tenders (ten-ton, six-wheel drive); and 4 D-8 or equivalent military bulldozers. Cooperative resources include air tankers, helicopters, hand crews, engines, and bulldozers.

The Base Fire Department has cooperative resource agreements in place with the U.S. Forest Service (USFS), California Department of Forestry, and both Orange and San Diego County firefighting agencies to effectively support suppression actions on the Base. However, these resources are not always available due to their commitment to other regional fire activities taking place at the time of request.

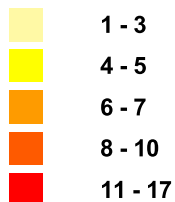
In addition, the Base utilizes air support firefighting resources when necessary. While very effective, such resources are also very costly. As a result, they are requested only when the resource being protected justifies the cost. Primarily, they are requested when there is a high risk that the wildfire might burn off the Base.

OBJECTIVE: Minimize the risk of adverse impacts from wildfires and fire management practices.



- Camp Pendleton Boundary
- Training Area Boundary
- Central Impact Areas (Restricted Access)
- Live Fire (Non-Dud Producing) Impact Areas

Number of fires per area (1973-1998)*



* Fire data incomplete and underrepresented within the Central (Dud-Producing) Impact Areas

Figure 4-1
Fire Frequency and
Spatial Distribution (1973-1998)



Map Source:
AC/S Environmental Security
GIS Branch
October 2001



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Priority Planned Actions:

- Have a qualified natural and cultural resource representative respond to all wildfires when called by the Fire Department. Provide on-the-ground natural and cultural resource expertise to help avoid and minimize adverse impacts from fire suppression activities. Ongoing.
- Provide natural and cultural resource technical services to the Camp Pendleton Fire Department to support their fire management planning efforts. Ongoing. [Also applies to Sections 4.11.1; 4.13.]
- Provide wildland fire management training to natural resources staff responsible for supporting wildland fire management on the Base. Ongoing. [Also applies to Sections 4.11.1; 4.11.3.]
- Develop a set of programmatic instructions/guidelines in coordination with the Fire Department for use during wildfire suppression activities. 2002. [Also applies to Section 4.11.1.]

4.11.3 Post-Suppression

Post-suppression actions include, but are not limited to: erosion control (reseeding, mulching), exotics control, and increased programmatic protection of site. Post-suppression fire management actions generally occur where a fire has burned occupied habitat or where erosion may become a problem. These activities are implemented to reduce or eliminate potential long term negative effects of fire and are intended to reduce the effects of direct and indirect suppression actions. Post-suppression activities are done only in unusual situations, usually where there is a direct impact or an immediate threat to federally listed threatened and endangered species or their habitat. Post-fire seeding may occur under limited conditions, as determined by the AC/S ES.

OBJECTIVE: Minimize the risk of adverse impacts from wildfires and fire management practices

Priority Planned Actions:

- Update the GIS database with wildland fire data annually. Map all wildland fires outside of impact areas that are greater than five acres and identify impacts to threatened and endangered species. Ongoing. [Also applies to Section 4.2.3.]
- Establish test plots to understand best management practices for natural resource recovery after wildland fire impacts. Ongoing. [Also applies to Sections 4.5.3; 4.6.1; 4.7.2, first objective.]

- Where possible use native seed stock if conducting post-fire reseeding. Ongoing. [Also applies to Sections 4.6.1; 4.7.2, second objective.]
- Provide wildland fire management training to natural resources staff responsible for supporting wildland fire management on the Base. Ongoing. [Also applies to Sections 4.11.1; 4.11.2.]
- Restore, using best management practices, firebreaks and roads that are no longer needed. Ongoing. [Also applies to Section 4.11.1.]
- Establish monitoring plots to track natural resource recovery after wildland fire impacts. 2002. [Also applies to Section 4.2.3.]
- Develop procedures for post-fire and post-fire suppression land restoration measures in selected areas. 2002.
- Evaluate present firebreaks needed to support the Wildland Fire Management Plan. 2002. [Also applies to Section 4.11.1.]

4.12 ENVIRONMENTAL PLANNING

Environmental planning and the provision of technical support for projects on Camp Pendleton are important for ensuring the sustainability of natural resources to support the military mission. Due to the wide variety of land uses occurring on Base and the number of Base organizations involved in land use decisions, Base environmental planning needs to be comprehensive and integrated. Moreover, the environmental portion of the planning process requires compliance with several interrelated laws and regulations designed to ensure that federal agencies assess, in detail, the potential environmental impacts of their actions that could significantly impact the quality of the environment. Camp Pendleton programs, plans (e.g., training management plans, master plans, pest management plans), and projects (e.g., construction of new ranges, roads, buildings) must be in compliance with natural resource laws and regulations and integrated with natural and cultural resources programs, plans, and projects. Failure to anticipate environmental planning requirements can cause project delays that can cost the government both financially as well as in staff time and missed training opportunities. Environmental site review conducted late in the planning process, particularly due to endangered species and cultural resource mandates, can cause uncertainties and delays in project implementation. However, conducted early in the design and site selection process it can become a positive and flexible tool rather than a negative one.

Environmental planning on Camp Pendleton occurs on different levels and scales (e.g., short term, project specific versus long term, regionwide). Program or project specific planning, which is relatively short term, is typically integrated with natural and cultural resource management via the National Environmental Policy Act process. Camp Pendleton's NEPA process provides a mechanism to help ensure that adverse impacts from specific projects and actions are avoided or minimized and that planning efforts are consistent with natural resource laws and regulations. Camp Pendleton's NEPA process is instrumental to the

successful integration of Base activities and programs. Initial planning stages of proposed actions must be integrated with the NEPA process “to ensure that planning and decisions reflect environmental values, to avoid delays later in the process, and to preclude potential conflicts” (32 CFR Ch.1, Part 188).

Beyond project specific planning, long term and master planning help to guide natural resource and land use integration through time, ensuring that Base activities (including development projects, recreation programs, natural resource management initiatives, etc.) are consistent with natural resource management requirements, goals, and objectives, and that those goals and objectives are consistent with the military mission. Long range, basewide planning provides an opportunity to evaluate the integration of, and consistency among, planned actions.

Base planning is integrated with the ECE process (Environmental Inspection and Compliance, Section 4.0.2.3) to assist commanders in identifying and correcting compliance gaps. The Commandant of the Marine Corps has issued policy which stresses the need to anticipate environmental issues and “take affirmative steps” to assure compliance (USMCB White Letter 9-91). He brings the responsibility and need to limit liability back to the planning process by suggesting the following steps, among others:

- Consider environmental issues during planning;
- Clearly designate responsibility for compliance;
- Provide staffing, organization, and training of those responsible for compliance; and
- Document environmental management efforts.

The Resource Planning Division of AC/S Environmental Security administers the NEPA process for MCB Camp Pendleton and the MCAS Environmental Office administers the NEPA process for MCAS Camp Pendleton. These offices have the duty to ensure that NEPA compliance has been accomplished and that the appropriate level of documentation has been prepared for new projects or actions and some continuing actions. Natural resource management support of Base projects includes (1) coordination of and participation in the NEPA process (e.g., review of proposed projects by staff biologists and planners, assistance in the development of alternatives that may avoid and minimize adverse impacts to natural resources and the environment), (2) consultation with environmental regulatory agencies, (3) management and integration of compensation and mitigation actions (e.g., identification of mitigation sites, development of mitigation banks, monitoring past mitigation sites), and (4) post-NEPA review and follow up.

Major laws governing potential impacts on federally listed threatened or endangered species, wetlands and migratory birds are the ESA, CWA, and MBTA, respectively. Following is a summarization of the requirements of these Acts to facilitate consideration early in the planning process and provide an understanding of areas that will be reviewed by Base and regulatory agency staff.

- Endangered Species Act (ESA): When evaluating actions potentially affecting threatened or endangered species, planners (e.g., Public Works Department, AC/S

O&T, AC/S MCCA, AC/S ES) must take into account the requirements of the ESA and the time lines needed for compliance. Formal consultations with the USFWS pursuant to Section 7 of the ESA (50 CFR 402) are required prior to federal agencies authorizing, funding, or implementing proposed actions that may affect a threatened or endangered species or its critical habitat. Preparation of a Biological Assessment is required before initiation of formal consultation.

The time required to prepare a Biological Assessment depends on the complexity of the proposed action and the magnitude of the potential effects on the species of concern. Potential requirements for additional information (e.g., surveys) can extend the time line for completion of the Biological Assessment. Anywhere from a few weeks to over a year may be required to finalize a Biological Assessment before it can be submitted to the USFWS as part of the request to initiate formal consultations. Once formal consultations are initiated, the consultations can be lengthy. Formal consultations involve up to a 90-day consultation period, and an additional 45-day period for the USFWS to prepare a Biological Opinion (135-day total). Either the lead agency or USFWS can request an extension of the formal consultation period but such extensions require mutual agreement. Conditions that may require an extension include complex issues or circumstances for which additional data (e.g., surveys) may be needed in order to avoid a jeopardy decision in the Biological Opinion.

A Biological Opinion is the USFWS opinion resulting from the formal Section 7 ESA consultation. It is a written statement from the USFWS regarding its opinion on the proposed federal action and a summary of the information upon which the opinion is based, including how the proposed federal action affects the species or its critical habitat. The Biological Opinion provides nondiscretionary Reasonable and Prudent measures that must be implemented in conjunction with a proposed action to avoid or minimize impacts. The USFWS also provides nonbinding conservation recommendations as part of the Biological Opinion.

A Biological Opinion is required for actions that may affect a threatened or endangered species so as to avoid violations under Section 9 of the ESA. Section 9 of the ESA prohibits the take of a threatened or endangered species. A take includes the direct killing, harming, or harassing of a species, or destruction of habitat that may be important for the species' survival or recovery. The term "harass" in this definition has been further defined to mean "...an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering (50 CFR 17.3)."

Part of a Biological Opinion is the issuance of an incidental take that authorizes take as long as it does not violate the terms and conditions established in the Biological Opinion. Terms and conditions can involve additional costs relative to mitigation requirements, which may include compensation for lost resources, minimization of, and avoidance of impacts on threatened or endangered species or critical habitat. Such potential costs need to be considered as part of project planning and construction.

Endangered Species Act consultations are accomplished for Camp Pendleton through the AC/S Environmental Security for MCB and the Environmental Officer aboard MCAS. For proposed nonmilitary actions on Camp Pendleton, the action proponent bears the responsibility for preparation of a Biological Assessment along with the documentation necessary for execution of consultation/conferencing requirements. Species and habitat information possessed by Camp Pendleton can be made available to action proponents; however, the proponent shall accomplish any needed supplementation or field verification. For nonfederal proposed actions on Base, Camp Pendleton, as a federal agency, is required to complete a Section 7 consultation/conference with the USFWS *prior to* authorizing or funding a proposed action which may affect a proposed or listed threatened or endangered species. This is Camp Pendleton's requirement regardless of any requirement the action proponent may or may not have regarding such species. All approvals will be conditioned upon the action proponent's commitment to fund and/or implement the Reasonable and Prudent Measures with associated terms and conditions that result from this consultation/conference procedure.

Camp Pendleton has developed Section 7 consultations that programmatically address ongoing training, routine and reoccurring maintenance, and a number of specific projects. These programmatic consultations both eliminate the requirement for individual consultation on activities or projects when programmatic instructions are followed and establish a process for determining specific mitigation requirements and criteria for reinitiating consultation on large projects. An activity/consultation classification system was included in the Riparian BO (USFWS 1995a) and proposed Biological Assessment of Upland Habitats to: (1) manage the conduct of future consultations; (2) reduce staffing requirements; (3) provide a systematic approach to deal with future proposed projects, activities, and operations; (4) increase the Base's mission flexibility; (5) satisfy Section 7(e)(2) requirements of the ESA for future programmatic consultations; and (6) define the level of formal consultation required for activities and projects.

- Clean Water Act: Clean Water Act permitting for Marine Corps actions on MCB Camp Pendleton are processed by the AC/S Environmental Security and by the MCAS Environmental Office for actions on MCAS Camp Pendleton. Preparation of permit application and associated information, wetland delineation, and other applicable information is the responsibility of the action proponent. Permitting necessary for non-Marine Corps proposed actions shall be accomplished and funded by the action proponent in coordination with Camp Pendleton staff. Completion of the regulatory permitting process is required for all federal and nonfederal actions prior to receiving final approval to implement the requested action.

For proposed actions involving navigable waters, including some wetlands, the requirements of the CWA need to be considered. The CWA contains specific provisions for the regulation of the disposal of dredge soil and materials within navigable waters. Permits are required under Sections 401, 402, and 404 of the CWA for proposed actions that involve wastewater discharges and/or dredging/placement of

fill in regulated wetlands or navigable waters. These permits are required *prior to* the initiation of proposed actions.

Section 404 of the CWA addresses the discharge of dredge or fill material into waters of the United States, including some wetlands (definitions at 40 CFR 230.3 [s] and [t]). The term “waters of the United States” is broadly defined to include navigable waters (including intermittent streams), impoundments, tributary streams, and wetlands. In general, wetlands are areas inundated or saturated by surface or ground water to the extent that they support vegetation adapted for saturated soil conditions (e.g., vernal marshes, and vernal pools). However, some wetlands do not meet the definition of “navigable waters” and are not regulated under the CWA. A discharge is any material that results in a change in the bottom elevation of a water body or regulated wetland, including grading, road fills, stream crossings, building pads, and flood and erosion control on stream banks. Regulatory authority has been delegated by the EPA to the U.S. Army Corps of Engineers for Section 404. Nationwide and individual permits are options for meeting the requirements of Section 404.

The ACOE has developed a series nationwide permits that pre-authorize certain minor discharges provided they meet certain conditions (e.g., construction of outfall structures, backfill or bedding for utility lines, fill for bank stabilization, and minor road crossings). Use of most nationwide permits requires review by the ACOE and possibly other federal agencies. Notification of the ACOE is usually required, and applicants must meet conditions outlined in the regulations and ensure the proposed project does not conflict with other federal laws (e.g., ESA, NEPA). Discharges that do not meet the conditions of a nationwide permit require an individual permit.

The individual permit process is much more complex and time consuming than the nationwide permit program. Typically the application process involves a pre-application meeting (if requested), permit application process, the posting of a public notice to allow for public comment, and a final decision by the ACOE in which the ACOE indicates its readiness to prepare an Environmental Assessment (or cause one to be prepared), Public Interest Review, and 404(b)(1) Evaluation. If the conclusion is that the action will cause significant impacts, then the ACOE must prepare an EIS (or cause one to be prepared). Further, all ESA requirements must be fulfilled before a permit can be issued.

Section 402 of the CWA addresses requirements for storm water discharges into natural drainages and is administered by the U.S. Environmental Protection Agency. Section 401 addresses water quality issues and requires issuance of a Water Quality Certification by the Regional Water Quality Control Board before a Section 404 Permit can be issued. The state may charge a fee for Section 401 permitting, although waivers can also be issued.

The CWA also requires federal agency consistency with state nonpoint source pollution management plans. Nonpoint source pollution results from ground disturbing actions such as construction, military training, and firebreak construction. Marine Corps’ policy is to support the development and implementation of nonpoint

source pollution management programs that ensure water quality protection. This is typically accomplished through the use of Best Management Practices. As defined by MCO P5090.2 (HQMC 1998): "...BMPs are practical, economical, and effective management or control practices that reduce or prevent water pollution or adverse impacts to natural resources." BMPs are applied as a system of practices based on site specific conditions rather than a single practice. BMPs are usually prepared by state agencies for land-disturbing activities related to agriculture, forestry, and construction.

- Executive Orders - Wetlands and Floodplains: In addition to implementing requirements of the CWA, Camp Pendleton also must administer Executive Order 11990, which directs all federal agencies to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands as well as to preserve and enhance the beneficial values of wetlands. Under the NEPA requirements section of MCO P5090.2 (HQMC 1998), all proposed land uses that would impact the quality or quantity of tidelands or freshwater wetlands are to be evaluated with the a minimum of an Environmental Assessment. In a similar manner, Camp Pendleton complies with Executive Order 11988 that directs federal agencies to provide leadership in avoiding direct or indirect development of floodplains, as well as to restore and preserve the natural and beneficial values of floodplains.
- Migratory Bird Treaty Act: The Migratory Bird Treaty Act is an international agreement between the United States, Canada, and Mexico that protects designated species of birds. Virtually all birds are protected under the MBTA (286 of the 315 observed on Camp Pendleton), see Appendix O. A complete list of all species of all migratory birds protected by the MBTA can be found at 50 CFR 10.13. The MBTA controls the taking of these birds, their nests, eggs, parts, or products. As part of planning and/or approving construction, re-construction, and maintenance actions, steps need to be taken to avoid impacts on migratory birds, their nests, and young. Wording needs to be placed in all contracts and work orders to prevent work delay costs to the government that may result from the presence of bird nests in work areas. The AC/S Environmental Security, Natural Resources Department, can provide contractual language prepared for and approved by the Navy for construction contracts on Camp Pendleton.

Federal agencies must obtain permits to take, possess, and transport migratory birds for scientific collecting and for the control of depredating birds or birds that pose a threat to human health and safety (referred to as "conflict management activities"). Killing of migratory birds is not permitted unless authorized to do so in the permit. Permits are not required for incidental takes of migratory birds due to training.

A recent Executive Order (EO 13186) directs each federal agency taking actions having or likely to have a negative impact on migratory bird populations to work with the U.S. Fish and Wildlife Service to develop an agreement to conserve those birds. The protocols developed by this consultation are intended to guide future agency regulatory actions and policy decisions; renewal of permits, contracts, or other

agreements; and the creation of or revisions to land management plans. In addition to avoiding or minimizing impacts to migratory bird populations, agencies will be expected to take reasonable steps that include restoring and enhancing habitat, preventing or abating pollution affecting birds, and incorporating migratory bird conservation into agency planning processes whenever possible.

The specific requirements of Executive Order 13186 will be detailed in an MOU by and between the DoD and USFWS. DoD has two years to complete the MOU and is developing guidance for this interim period. The thrust of the guidance is to comply with the intent of the Executive Order, ensuring where installation activities may result in adverse impacts to migratory birds, such impacts are considered, and where appropriate, mitigated through NEPA planning processes.

GOAL: Integrate natural resource requirements with master planning and planning of mission activities to minimize unnecessary future impacts to mission.

GOAL: Initiate NEPA and environmental planning early enough in the project planning process to reduce delays in the schedule of proposed actions.

GOAL: Fully evaluate and document impacts of proposed actions and integrate them with environmental and natural resource programs when impacts require mitigation.

GOAL: Streamline environmental assessment procedures to enhance the mission-related use and stewardship of the Base's natural resources.

4.12.1 NEPA Review

The primary planning tool for the evaluation of projects and actions potentially affecting the environment and for the coordination of these projects and actions with Camp Pendleton's environmental management programs is the National Environmental Policy Act. NEPA is the basic national charter for the protection of the environment (HQMC 1998) and requires federal agencies to assess and document, in detail, the potential environmental impacts of their actions that could significantly affect the quality of the environment. NEPA is intended to help decision makers make informed decisions and take actions that protects, restores, and enhances the environment. In brief, the NEPA process requires that the Base: consider the environment in decisions concerning potential individual and cumulative impacts; make diligent efforts to inform and involve the public at appropriate stages in the decision making process; develop and evaluate less environmentally damaging alternatives to potential projects; and support informed decisions with quality documents.

NEPA requires a detailed statement of significant environmental impacts of major federal actions. For example, an action may be considered significant if it has a long term impact or potential risk because of its effect on a species protected under the federal ESA. The process identifies reasonable alternatives to proposed actions that might have less or no

environmental effect. Individual and cumulative impacts must be considered. The following three-tiered approach is used to document impacts:

- Categorical Exclusions are used for actions that do not individually or cumulatively have a significant effect on the human environment and therefore do not require preparation of an Environmental Assessment (EA) or Environmental Impact Statement (EIS).
- An EA is the analysis to be completed when the government is uncertain as to whether an action will significantly affect the environment or whether the action is controversial; the result of an EA is either a Finding of No Significant Impact or a requirement to complete an EIS.
- An EIS is a full-disclosure document that presents a full and complete discussion of significant impacts, informing the public and decision makers of reasonable alternatives to the proposed action.

Camp Pendleton has established Base specific regulations to guide NEPA procedures (BO 5090.2A) that lay out roles and responsibilities and the procedures to be followed to ensure potential impacts to the environment are assessed, documented, and considered before the decision is made to proceed with an action or project. This Base NEPA Order established a comprehensive program, with varying levels of decisional authority to Base entities, to ensure that all federal actions are conducted in compliance with NEPA. The Base Order identifies data needs and level of required NEPA documentation, clearly delineating responsibilities for environmental review. Camp Pendleton's NEPA documents incorporate natural and cultural resource programmatic and specific instructions as conditions for the conduct of projects and actions.

During the NEPA review process, the natural resource managers within these offices help to (1) identify potential adverse impacts from the project, (2) identify less damaging alternatives, (3) ensure that adequate mitigation is planned, (4) provide compliance with natural resource laws and regulations, and (5) maintain consistency with natural resource management goals and objectives. MCAS is developing a programmatic Environmental Assessment for infrastructure development and maintenance. This planning document will be based on the MCAS Master Plan and will provide "umbrella" NEPA coverage for MCAS facilities. NEPA analysis for future actions will be tiered from this Environmental Assessment.

Currently, the Resource Planning and Resource Management Divisions of AC/S ES utilize two databases to document and track NEPA and mitigation project activities. These databases are known as E-Trax and the "Mitigation Database," respectively. NEPA projects and mitigation are also tracked using GIS systems within AC/S ES and AC/S Facilities. The ultimate objective for NEPA project and mitigation tracking is to have a single, consistent interface for maintaining tracking data. The first phase of development of this new, integrated E-Trax system has been completed and is beginning to be utilized. Completion of the second phase, which integrates the mitigation tracking element, is contingent upon funding availability.

OBJECTIVE: Fully implement the NEPA review process to facilitate project planning and integrate project specific plans with overall Base land use and natural resource management plans.

Priority Planned Actions:

- During project and NEPA review, ensure that direct or indirect adverse impacts to federally listed species, critical habitat, floodplains, wetlands, and other sensitive resources are identified and avoided or minimized when possible. Ongoing. [Also applies to Section 4.3.1, second objective.]
- Clearly identify the project proponents/offices/positions accountable for project implementation and mitigation requirements for each new project. Ongoing. [Also applies to Sections 4.12.1, second objective; 4.12.3.]
- Contact off-Base interested and affected agencies and parties as soon as possible on projects with potentially significant environmental impacts, particularly if controversial. Ongoing.
- Provide NEPA and impact assessment training for designated NEPA personnel including public works and ROICC. Ongoing. [Also applies to Section 4.12.1, second objective.]
- Ensure all real estate leases and agreements, including renewals, are evaluated through the NEPA process. Ongoing.
- Ensure that all new activities with potential direct or indirect permanent impacts to federally listed species undergo NEPA review and are subject to the activity/consultation class system (as defined in the Estuarine and Beach Ecosystem Conservation Plan, the Riparian Ecosystem Conservation Plan, the Listed Upland Species Management Program, and their respective Biological Opinions). Ongoing. [Also applies to Section 4.12.2.]
- Prepare and regularly update a NEPA Handbook that clearly and simply outlines step-by-step Base procedures for the management and preparation of NEPA documents. Included should be a recommended format for Environmental Assessments and Environmental Impact Statements to facilitate contractor and in-house preparation of consistent documents. 2002.

OBJECTIVE: Improve the NEPA planning process in order to better facilitate project planning and integrate project specific plans with overall Base Master Planning, land use and natural resource management plans.

Priority Planned Actions:

- Track the early planning phases of future activities, including major training exercises, and construction projects in order to facilitate early awareness, implementation and compliance with programmatic instructions and early consultation with the Service if appropriate. Ongoing. [Compliance requirement of Riparian BO (Appx 4, p. 3)]
- Provide technical assistance to other Base offices before and after a proposed action is submitted for NEPA review. Ongoing.
- Provide NEPA and impact assessment training for designated NEPA personnel including public works and ROICC. Ongoing. [Also applies to Section 4.12.1, first objective.]
- Clearly identify the project proponents/offices/positions accountable for project implementation and mitigation requirements for each new project. Ongoing. [Also applies to Sections 4.12.1, first objective; 4.12.3.]
- Reinitiate Quarterly environmental planning meetings between MCB and MCAS. 2002.

Other Planned Actions:

- Seek to expand the use of Programmatic Categorical Exclusions to define categories of actions which experience has indicated will not individually or cumulatively have a significant effect on the human environment. ***
- Encourage each Base office to annually anticipate their projects or actions and seek yearly “programmatic” Categorical Exclusions for all projects that qualify. ***
- Complete the second phase of E-Trax development, testing, and implementation. [Also applies to Section 4.12.3.] ***

4.12.2 Consultations

It is Marine Corps policy that installations must comply with laws for the protection and management of natural resources (see legislative and regulatory drivers in Appendix B). To ensure compliance, Base projects and actions that may affect regulated resources require consultation with, and/or acquisition of required permitting documentation from, appropriate regulatory agencies. Natural resource managers at Camp Pendleton are routinely in communication with agencies such as the USFWS, ACOE, State of California Regional Water Quality Control Board, California Coastal Commission, and San Diego Air Pollution

and Control District.

To facilitate effective and efficient management of Base resources while ensuring regulatory compliance for ongoing programs and actions, programmatic consultations have been established in coordination with appropriate regulatory agencies. For example, the Base has consulted under Section 7 of the federal Endangered Species Act with the USFWS on ongoing activities and ecosystem conservation programs (Estuarine and Beach Ecosystem Conservation Plan and the Riparian Ecosystem Conservation Plan) within riparian and estuarine/beach habitats on Base. This consultation resulted in the Riparian BO (USFWS 1995a). The Base is currently in consultation with the USFWS for the corresponding Upland Habitat Biological Assessment and Listed Upland Species Management Program. Within all of these plans/documents are Consultation Class Systems (Table 4-2) for directing future consultations on Base projects. The purpose of this programmatic Class System approach is to: (1) satisfy Section 7(e)(2) of the ESA requirements for future consultations, (2) provide a systematic method for dealing with future proposed projects in a consistent, predictable manner, (3) increase the Base's mission flexibility, (4) identify activities which require formal consultation with the USFWS, and (5) reduce staff time (for both the Base and the USFWS).

While formal consultations are required under many circumstances, natural resource managers often engage in informal consultations with regulatory agencies as well. Such informal consultations are integral to the continued assurance of compliance under varying circumstances, to facilitation of management planning and project support, and to building of positive working relationships with regulating agencies.

Apart from MCAS, which maintains its own environmental compliance staff, the AC/S Environmental Security serves as the lead organization for planning and addressing natural resource compliance issues such as wetland, endangered species, and air and water quality regulatory requirements. The Office of Water Resources also acts as a Base liaison with federal, state, and local conservation and public health officials and community interests regarding water resource management and protection.

OBJECTIVE: Assess and pursue the development of conservation agreements and/or programmatic consultations with regulatory agencies (e.g., USFWS, ACOE, etc.) to provide compliance with laws and regulations for Base actions.

Priority Planned Actions:

- Ensure that all new activities with potential direct or indirect permanent impacts to federally listed species undergo NEPA review and are subject to the activity/consultation class system (as defined in the Estuarine and Beach Ecosystem Conservation Plan, the Riparian Ecosystem Conservation Plan, the Uplands Conservation Plan, and their respective Biological Opinions). Ongoing. [Also applies to Section 4.12.1, first objective.]

4.12.3 Mitigation and Compensation

Natural resource managers provide project and mission support through the planning, implementation, integration, and monitoring of mitigation and compensation measures. Mitigation is lessening the adverse effects an undertaking may cause relative to natural resources. Mitigation can include avoiding the effect altogether; limiting the magnitude of the action; repairing, rehabilitating, or restoring the affected resource; reducing or eliminating the effect over time by conservation and maintenance operations during the life of the action; and/or compensating for the effect by providing substitute resources or environments (U.S. DoD 1996). In general, regulatory agencies' preferred order of performing mitigation is avoidance, then minimization, then compensation in kind, and then compensation out of kind.

To separately address the potential adverse effects caused by ongoing land use activities (e.g., training, maintenance, fire management, recreation), in the proposed management plan for federally listed species in upland habitats on Base (Uplands Biological Assessment), Camp Pendleton refined the definition of mitigation. The refined definition of mitigation refers to measures taken to offset potential adverse biological effects from actions that may have *permanent* direct or indirect impacts to federally listed species, critical habitat, or other regulated resource. Compensation refers to measures taken to offset potential biological effects from actions that may have *temporary* direct or indirect impacts to federally listed species, critical habitat, or other regulated resource. Temporary impacts from ongoing Base activities are inevitable. These impacts, in addition to being temporary, are impossible to quantify due to the almost infinite variations of personnel, equipment, transportation, and time/duration of training events. To minimize and compensate for such unavoidable, unquantifiable temporary impacts in upland habitats, the Base has proposed several basewide management initiatives, management plans and conservation plans. While some of these initiatives/plans may not be specific to a listed species, all resources on Base are expected to benefit either directly or indirectly from successful implementation of these programs.

As part of mitigation planning, careful consideration must be given to the siting of proposed actions and potential compensating mitigation relative to existing land uses and natural resources early in the planning process. As part of Camp Pendleton's ongoing efforts to avoid and/or minimize impacts to threatened or endangered species, vernal pools, other wetlands, and constrained regional habitat linkages, first consideration will be given to use of marginal or nonnative vegetation areas. This will, in turn, enable planners to reduce costs (in terms of funding, manpower, and time) to plan, obtain regulatory approvals, and implement proposed actions. Locating suitable mitigation sites on Camp Pendleton that will not conflict with military operation requirements is becoming increasingly difficult. Generally, mitigation requirements in compensation for impacts by nonmilitary actions on Camp Pendleton will be accomplished off of the Base. Further, Camp Pendleton cannot be used for mitigating the impacts of actions occurring off Camp Pendleton that affect natural resources (U.S. DoD 1996, paragraph F.1.i [3]). Persons planning and/or preparing mitigation actions need to be aware that military lands cannot be set aside as permanent environmental preserves. The DoD, and the Marine Corps in particular, must maintain the flexibility to adapt its defense mission to political and technological developments (U.S. DoD 1996, paragraph F.1.i [4]).

The type of mitigation proposed for a specific impact will be addressed on a case-by-case basis. The action proponent is responsible for ensuring that mitigation requirements for a proposed action are planned, funded, and implemented. As the action proponent typically does not have in-house expertise for conducting the biological elements of mitigation requirements, these actions are often accomplished through contractual agreements. The AC/S ES (Environmental Officer for the Air Station) oversees any mitigation actions that require restoration, enhancement, monitoring, etc. of the resources. Because the funding for MILCON projects is congressionally limited to use within a five year period, it is important to develop mitigation objectives that can be met within this timeframe.

Project specific requirements and details that are appropriate for a proposed action cannot be provided in this INRMP since such specifics must be tailored to each individual project and determined through applicable consultation and permitting processes in coordination with regulatory agencies. However, many elements of mitigation actions and planning are common to most situations. The following mitigation measures should be planned for all proposed actions unless a determination can be made, in consultation with Natural Resources Department (AC/S ES) staff, that they are not appropriate:

- Impact Avoidance and Minimization. The first step in mitigation planning should be avoidance of impacts. The primary purpose of mitigation is to lessen the severity of an action. Once avoidance has been implemented to its fullest extent, remaining impacts should be minimized. This must be the first step in the mitigation planning process because numerous regulatory authorizations require demonstration of maximum impact avoidance and minimization before authorization may be given. Avoidance and minimization of adverse impacts may involve modification of building design or orientation, adjustments to the exact siting, and monitoring activities carefully to avoid unnecessary and incidental resource damage. Limitations on the timing of activities are also often required for avoiding and minimizing adverse impacts to natural resources (e.g., to avoid behavioral disruptions during the breeding season for federally listed birds). Proposed actions must include requirements for impact avoidance and minimization measures as part of implementation of any proposed action. Measures which should be considered include: worker environmental protection briefings, signs, markers, protective fencing, exclusion fencing, biological monitoring, erosion and sedimentation prevention, noise baffling, and temporary impact restoration. These measures should be included as part of an Environmental Protection Section in all Standard Operating Procedures, work requests, and contracts effecting natural resource areas.
- Effects Analysis. Potential direct and indirect effects of a proposed action must be addressed when planning mitigation. Direct effects occur immediately upon impact of the action. Indirect effects have an impact at some point later in time. An example of indirect effects includes the case where use and maintenance of a new facility is likely to have an adverse effect beyond the building “footprint” following construction. Fencing may be necessary to prevent landscape maintenance and concentrated human foot traffic from damaging naturally occurring resources that were avoided by the construction of a building. Often, maintenance and safety considerations associated

with new or re-utilized facilities, such as wildfire fuelbreaks, are overlooked by planners and are not realized until the project is implemented. Such considerations must be treated as part of the initial project and mitigated accordingly. Some direct effects of a proposed action may be less tangible; a common concern is noise and nighttime lighting associated with construction. As a general rule, noisy construction activities need to be kept far enough away from noise sensitive threatened and endangered species such that the level in the occupied habitat varies little from background. Other examples include outdoor lighting that may require shielding, visual harassment by human activities and equipment operation, changes to wetland hydrology, and sedimentation from construction sites to wetlands. Often the temporary effects that may result from construction are avoided by performing work outside the sensitive breeding and growing seasons as presented in this planning guidance. Other effects that are likely to have a longer or permanent adverse effect must be mitigated.

- Endangered Species Act and Presence/Absence Determinations. Threatened or endangered species presence or absence determinations must be made using survey guidelines developed by the U.S. Fish and Wildlife Service or other means acceptable to them. Where no such guidelines or protocols exist, surveys must be conducted by qualified persons (see minimum criteria for biological monitor, below) using methods recognized and accepted in the professional consulting field. When making presence/absence determinations relative to a project, areas where indirect effects may adversely impact a species must be considered as well. If a habitat is used by a species for some important part of their life cycle, it is considered occupied regardless of whether the species is temporarily absent. Survey protocols or draft protocols have been developed for all federally listed species found on Camp Pendleton.
- Migratory Bird Treaty Act. The MBTA and implementing regulations and orders generally protect migratory birds. On Camp Pendleton, all birds but four are covered under the MBTA. Planners must review proposed actions with regard to conduct of actions during the active breeding seasons (can be January through September) and project caused loss of traditionally used nesting/roosting sites. Habitat clearing activities should be timed to avoid breeding seasons to the maximum extent practicable to avoid damage to active bird nests. Compensation for the loss of traditionally used nesting/roosting sites may be an issue for raptors and colonial nesters, such as herons. All contracts and work orders prepared for Camp Pendleton must include provisions in an Environmental Protection section that prohibit harming, damage, or destruction of active bird nests while requiring “work arounds” without incurring additional cost. The Natural Resource Department (AC/S ES) can provide contractual language for construction contracts.
- Biological Monitor. An on-site biological monitor is typically required for all proposed actions that require active avoidance, are expected to affect threatened or endangered species or wetlands (including vernal pools), or require active revegetation or habitat compensation. The role of the biological monitor is to educate workers regarding applicable natural resource related issues, oversee and implement impact avoidance and minimization, document impacts, and/or guide revegetation

efforts. At a minimum, this individual must have: (1) a bachelor's degree with an emphasis in ecology, natural resource management, or related science; (2) demonstrated local experience with the resource(s) involved; and (3) a good understanding of the regulations regarding wetlands and endangered species.

- Mitigation Costs. The cost of mitigating impacts to natural resources should be considered when evaluating proposed action alternative locations and planning for funding. Mitigation must be treated as part of the project that will be fully funded by the action proponent. Some environmental authorizations and permitting require mitigation funding to be secured and assured prior to causing adverse affects. Resource mitigation costs can be highly variable depending on the specific details of the project (e.g., extent of habitat impacts, type of habitat impacted, duration of impacts, habitat compensation site conditions, and technologies). Provisions of actual cost estimates for mitigation on a "per acre impacted" basis are too variable and project specific to be presented here. Technical natural resource specialists should be contacted during project planning to assist with estimating the likely mitigation costs associated with a proposed action. Cost considerations for impact prevention during action implementation need to be accounted for, as well as habitat restoration and/or compensation (e.g., biological monitoring, placing protective signs/fencing, sedimentation controls, etc.).
- Mission and Management Compatibility. Beyond the financial costs of mitigation actions, the effects on future land use must also be considered. These "costs" can seriously affect the future flexibility of military mission accomplishment. Mitigation actions that involve habitat compensation or enhancement on Camp Pendleton must be planned to support or be compatible with training requirements, long term natural resource management programs, and the Base Master Plan where possible. Site evaluations and approvals for habitat compensation and enhancement must be initiated concurrently with proposed action planning whenever possible. The ideal situation would be for the actual habitat work to start concurrently or before the action causing an impact. The Base may seek opportunities to mitigate at off-Base locations to contribute to the regional recovery efforts for the species and to maintain mission flexibility on Base. Off-Base mitigation sites should be selected in cooperation with regional planning and conservation agencies and approved by the Service. Agreements with the USFWS made in advance of proposed actions may provide flexibility in mitigation requirements and post-mitigation land use restrictions. Such agreements may include mitigation banking (see below), a return to pre-mitigation training restrictions following successful mitigation, mitigation initiatives that do not directly involve habitat restoration/enhancement, and off-Base mitigation.
- Mitigation Plan. All actions that require active habitat restoration, enhancement, and/or compensation must have an appropriate plan developed prior to implementation. Such plans must discuss the site conditions, methods to be implemented, monitoring and maintenance (usually 3 to 5 years), success criteria, remedial actions if expected success is not being achieved, and reporting requirements. The plans must ensure that all applicable requirements of regulatory

approvals are incorporated. Review and approval of plans must be accomplished through the AC/S Environmental Security. In addition, regulatory agencies often require that they have an opportunity to review and approve plans where their authorization is needed for resource impacts.

To facilitate mission requirements and reduce costs, long-term mitigation planning at Camp Pendleton will focus on the development of mitigation banks and conservation agreements. Mitigation banking is defined as "actions taken to compensate for future adverse effects of undertakings by providing resources or environments in advance of any specific undertaking" (U.S. DoD 1996). The primary objective of mitigation banking is to receive credit for habitat improvement or conservation towards mitigation for future projects. Mitigation banking typically reduces the mitigation ratios required for planned actions.

In recent years, many large-scale mitigation land banks have been established in California. With twenty mitigation banks in operation or being established, San Diego County has more mitigation banks than in all other counties of the southern California region (i.e., San Luis Obispo, Kern, and San Bernardino Counties south to the international boundary). Examples of mitigation banks in San Diego County include O'Neal Canyon, Rancho San Diego, Ramona, and Upham. These last two focus on vernal pools. The size of the banks ranges from 25 to 1,840 acres. Given the expanding requirements for training and existing constraints to land use, first consideration would be given to establishing mitigation banks off of Camp Pendleton as an option for meeting natural resource mitigation requirements. The possibility of contributing funds to a third party towards purchase of preserve lands within the MSCP study area will be explored in revisions to this INRMP.

A conservation agreement is a formal document agreed to by the USFWS and other cooperators that identifies specific actions and responsibilities for which each party agrees to be accountable. The objective of a conservation agreement is usually to reduce threats to a candidate or proposed species or its habitat, possibly lowering the listing priority or eliminating the need to list the species. Conservation agreements are usually less restrictive than mitigation banks and do not require transfer of ownership. When appropriate, Camp Pendleton will consider the option of a conservation agreement. MCAS Yuma has recently (6 June 1997) entered a conservation agreement to help conserve the flat-tailed horned lizards (*Phrynosoma mcallii*) on the Barry M. Goldwater Range in Arizona. This species was proposed for federal listing as threatened but the proposal was withdrawn as a result of the signing of the conservation agreement.

If mitigation banking and/or conservation agreements are considered, early involvement of USFWS and other agencies is essential. Such agreements include mechanisms by which future Section 7 consultations and accompanying Biological Opinions will direct mitigation requirements. For example, terms and conditions of future Biological Opinions that involve the set-aside or special management of habitat would draw on a mitigation bank or conservation agreement. This would allow comprehensive long-term mitigation planning, rather than project specific or activity specific mitigation.

OBJECTIVE: Provide project and mission support through the planning, implementation, and integration of mitigation and compensation measures.

Priority Planned Actions:

- Ensure that all direct or indirect permanent impacts to federally listed species are mitigated in accordance with USFWS determined measures and ratios. Ongoing.
- Monitor mitigation sites as determined in the agreement with the regulatory agency following enhancement/restoration efforts to ensure compliance. Ongoing.
- Ensure mitigation projects support or compliment the Base's training area development plan, master plan and goals and objectives for natural resource management. Ongoing.
- Conduct habitat restoration/rehabilitation (including exotics control) for the mitigation of existing projects in accordance with the Riparian Ecosystem Conservation Plan, the Estuarine/Beach Conservation Plan, and the Listed Upland Species Management Program. Ongoing.
- Identify areas both on and off Base that may be used as mitigation sites for future projects. Ongoing.
- Develop mitigation "banks" in anticipation of future project needs. Ongoing.
- Clearly identify the project proponents/offices/positions accountable for project implementation and mitigation requirements for each new project. Ongoing. [Also applies to Section 4.12.1, first and second objectives.]
- Develop an off-Base mitigation bank for future Air Station project needs. 2002.
- Develop a system for tracking mitigation conducted for banking credits and for specific projects. 2002.
- Evaluate the feasibility and desirability to negotiate with regulating agencies reduced mitigation costs for development projects within predetermined cantonment buffers. 2002.
- Evaluate the effectiveness of mitigations applied to various projects in avoiding significant environmental impact, and readjust if necessary. Document the Base's experience and successes to convincingly demonstrate mitigations will reduce impacts to less-than-significant. 2004. [Also applies to Section 4.12.4.]

Other Planned Actions:

- Identify candidate sites for future wetland mitigation to compensate for unavoidable wetland value losses (and include in future master planning documents). [Also applies to Section 4.3.1, first objective.] ***
- Complete the second phase of E-Trax development, testing, and implementation. [Also applies to Section 4.12.1, second objective.] ***

4.12.4 Post NEPA Follow up

Upon receipt of permits, biological opinions, and other consultation documents, it is the Base's responsibility to ensure that the terms and conditions, mitigation, and other nondiscretionary requirements are implemented. The AC/S Environmental Security serves as the lead organization for conducting post NEPA follow up except for actions with no regulatory consultations that take place entirely on MCAS. The aforementioned E-Trax and Mitigation Database are expected to facilitate post NEPA follow up.

OBJECTIVE: Monitor to ensure mitigation compliance for projects implemented or actions taken as set forth in existing NEPA decision documents, Biological Opinions, 404/401 permits, and Coastal Commission determinations.

Priority Planned Actions:

- Ensure the execution of commitments and terms and conditions within consultation documents issued to the Base for DoD and non-DoD agency proposed actions. Ongoing.
- Develop and maintain a comprehensive list of commitments and terms and conditions contained within the numerous formal and informal consultation documents and permits issued to or that apply on the Base. 2002.
- Evaluate the effectiveness of mitigation applied to various projects in avoiding significant environmental impact, and readjust if necessary. Document the Base's experience and successes to convincingly demonstrate mitigations will reduce impacts to less-than-significant levels. 2004. [Also applies to Section 4.12.3.]

4.12.5 Long Range and Master Planning

Long range environmental planning is key to successful natural resource management, integration, compliance, and mission support at Camp Pendleton. Long range planning helps to ensure that Base activities are consistent with natural resource management goals and

objectives, and that those goals and objectives are consistent with the military mission. Long range planning helps to ensure the integration of, and consistency among, planned actions.

The INRMP itself is an important long range planning document for developing environmental baseline information to support activity and operational planning, formalizing natural resource goals and objectives, establishing planned actions to help meet those goals and objectives, and integrating actions and responsibilities basewide. The INRMP review and revision process (Chapter 1) is as important as the document itself, providing a venue for self-evaluation, communication, adaptive management, and further refinement of long range planning and integration.

It is important that the INRMP be fully integrated with other planning documents on Base, especially the Base and Air Station Master Plans. The installation master planners, who are usually within public works, should be very familiar with the INRMP because they designate land use. Master plans typically extend to a 20- to 30-year period, whereas the INRMP provides a planning period of five years. The INRMP may identify designated sensitive areas with land use restrictions. It is imperative that natural resource managers coordinate such restricted areas with the master planners so that, at a minimum, they can be incorporated into the master planners' maps and GIS. Currently, the MCB and MCAS Master Plans primarily focus on the development of facilities and are in the process of being up-dated and integrated with other long term planning documents on Base (including those for training, fire management, and natural resource management). The INRMP is expected to complement and be fully compatible with Master Plans and support strategic planning.

OBJECTIVE: Maintain the integration and relevance of long range planning documents to support the long term sustainability of Base resources and the military mission.

Priority Planned Actions:

- Conduct semiannual INRMP review meetings. Ongoing.
- Integrate natural resources management objectives with mission activities and facilities development. Ongoing.
- Attend Base planning meetings, the Range Working Group meetings, and other meetings to maintain currency with long range Base planning topics and land user requirements. Ongoing.
- Develop and implement an Adaptive Management Plan for MCAS. 2002. [Also applies to Section 4.1.1, second objective.]
- Complete a programmatic Environmental Assessment for the MCAS master plan. 2003.
- Revise the INRMP every 5 years. 2006.

Other Planned Actions:

- Integrate the INRMP into the Base and MCAS Master Plans. ***
- Ensure the INRMP is integrated as appropriate into other Base planning documents. ***

4.13 EMERGENCY RESPONSE

Emergency situations are defined to include acts of God, disasters, casualties, and national defense or security emergencies. Although the timing and extent of such emergencies may not be entirely predictable, it is always possible that such events may occur. In addition to prevention and early detection measures that help reduce the probability of an event occurring or the extent of the damage should an emergency situation arise, the Base recognizes the importance of advance preparation to the fullest extent possible/feasible for handling emergency situations. It is understood that the nature of emergency situations does not always permit avoidance and minimization of impacts to sensitive resources and the environment; however, advance preparation is expected to facilitate avoidance and minimization of impacts where possible and to prevent the exacerbation of adverse environmental impacts during responses to emergency situations.

With respect to potential federally listed threatened and endangered species take incidents incurred by necessary response actions to such emergency situations, 50 CFR 402.05 allows for after-the-fact review of impacts under such circumstances.

GOAL: Develop and implement an Emergency Response Action Plan to avoid and minimize adverse impacts to environmentally sensitive areas and other natural resources.

OBJECTIVE: Develop and implement an Emergency Response Action Plan to avoid and minimize adverse impacts to environmentally sensitive areas and other natural resources.

Priority Planned Actions:

- Provide natural and cultural resource technical services to the Camp Pendleton Fire Department to support their fire management planning efforts and hazardous incident plans. Ongoing. [Also applies to Sections 4.11.1; 4.11.2.]
- Maintain a contract with San Diego County Hazardous Incident Response Team or a similar organization to provide hazardous substance identification and incident technical advice. Ongoing.

Other Planned Action:

- To the extent feasible and consistent with the military mission, ensure integration of natural resources concerns with the Base's emergency mobilization/deployment plans to minimize unnecessary impacts during such emergency situations. **

4.14 INFORMATION MANAGEMENT

Information management (the collection, analysis, storage, maintenance, presentation, and distribution of data) is fundamental to the integration and implementation of natural resource management and the ability to make informed decisions. Comprehensive, well maintained, and accessible GIS based data enable managers, planners, military trainers, and other users of Camp Pendleton to avoid potential land use conflicts through the spatial representation, analysis, and modeling of activities, planned actions, and sensitive resource management.

Types of data required to support management include those collected in Section 4.2 (Natural Resources Inventory) of this chapter (e.g., vegetation types and distributions, plant and animal population sizes and distributions, fire frequency and distribution, floodplain and watershed boundaries, long term trend monitoring, etc.) as well as topographic, soil, land use (roads, buildings, ranges and training area designations, agricultural and park leases, etc.), and other physical features and administrative boundaries. Although not all natural resource data is linked geospatially to locations on the Base, many management decisions, including effectiveness of management plans and adaptive management decisions, require an understanding of the temporal and spatial relationships (e.g., proximity, fragmentation, distribution, etc.) within and among the data. As many of the training areas and locations of sensitive resources are not demarcated in the field, GIS based maps are currently the primary tool for implementing programmatic instructions and for integrating land use and natural resource management in general. This geospatial technology has also provided Camp Pendleton with the potential for facilitated, and increased accuracy in, communication of changes in land use and natural resources information. In addition to increased efficiency in daily operations, well maintained and accessible GIS based data also improves the likelihood of success for long term, master planning.

Several organizations on Base are GIS capable; however, only a few organizations generate the data for end users and serve as the primary administrators of GIS based information. Organizations that generate and manage GIS data on Camp Pendleton include the Public Works Office (AC/S Facilities), Range Operations Division (AC/S O&T), the Information Systems (IS) Branch (AC/S ES), and the Environmental Department at MCAS (see Appendix H for brief descriptions of the role and functions of each organization). It is the IS Branch's policy to create, update, maintain, manage, and analyze all GIS data layers to ensure that this information is available to biologists, planners, and contractors quickly and readily in digital or hard copy format.

Natural resource information management is complex because ecosystems and spatial data are complex and the data necessary to develop composite pictures are inherently cross

disciplinary. Ultimately, the utility and efficacy of GIS based planning and analysis for natural resource management, integration, and implementation requires skilled and knowledgeable system administrators; assurances of the quality and integrity of the data; and adequate accessibility to the necessary technology by Base users, managers, and planners.

GOAL: Provide current, integrated, and accessible natural resource information to on Base and off Base data consumers for comprehensive and effective natural resource management and integration.

4.14.1 System Administrator/User Community

The value and efficacy of information management and GIS data is dependent upon both the knowledge and responsiveness of systems administrators to users' needs and the knowledge and capabilities of the system users. State-of-the-Art technology is of little value if no one uses it.

First equipped with GIS capabilities in 1994, the Base has since been expanding and refining the application of this tool basewide. In 1997, efforts were begun to incorporate GIS technology within all areas of the Base's environmental and natural resource program. In 1997/1998, a comprehensive GIS/IS User Needs Assessment was completed identifying program requirements for GIS. The assessment identified over 100 potential applications of GIS technology within the Base's environmental program. In addition, the assessment provided an analysis of the data requirements of the entire program in accordance with the existing Spatial Data Standards (SDSs) for Facilities, Infrastructure, and Environment (SDSFIE).

OBJECTIVE: Establish/promote a community of managers/users to project the far-reaching vision for geographic information systems development.

Priority Planned Actions:

- Participate in regional GIS working groups. Ongoing.
- Establish an executive level working group ("Geographic Information System Policy Group") with participants from all Base organizations to promote the forward vision and information sharing. 2002.
- Establish a technical level working group ("Geographic Information System Technical Working Group") with participants from all organizations to promote information sharing and resolution of common technical issues. 2002.
- Build the understanding and utility of the GIS to Base land use decision makers by developing a demonstration of its successful implementation, such as conducting

some what-if scenarios for presentation. 2002. [Also applies to Section 4.14.1, second objective.]

OBJECTIVE: Continuously educate managers and users on organizational and technical aspects of GIS.

Priority Planned Actions:

- Provide continuing education in advanced GIS technologies through outside industry sources and/or workshops and conferences. Ongoing.
- Provide training on system software and capabilities to end users. Ongoing.
- Develop GIS education programs for upper level managers and command staff, for technical “power” users, and for basic “casual” users. 2002.
- Create a demonstration of data resolution limitations for a range of environmental applications, and the hazards of using multiple map scales. 2002. [Also applies to Section 4.14.2, third objective.]
- Build the understanding and utility of the GIS to Base land use decision makers by developing a demonstration of its successful implementation, such as conducting some what-if scenarios for presentation. 2002. [Also applies to Section 4.14.1, first objective.]

4.14.2 Data Integrity and Technology Advancements

Equally important as the knowledge and capabilities of system administrators and users are the integrity of the data and the capabilities of the interfacing technology. The utility of data depends upon the quality and quantity of the information generated as well as the format (e.g., application of universal standards) within which the data is stored.

The U.S. Army Corps of Engineer’s Computer-Aided Design and Drafting (CADD)/Geographic Information System Technology Center for Facilities, Infrastructure, and Environment has been assigned to develop SDSs for Facilities, Infrastructure, and Environment. The SDSFIE has focused on the development of graphic and nongraphic standards for GIS implementations at Air Force, Army, Navy, and Marine Corps installations, the U.S. Army Corps of Engineers Civil Works activities, and other government organizations.

The SDSFIE provide a standardized grouping of geographically referenced (i.e., geospatial) features or objects (i.e., real-world) depicted graphically on a map at their real-world location (i.e., coordinates). Each geospatial feature has an “attached” attribute table containing pertinent data about the geospatial feature.

The SDSFIE is the only “nonproprietary” GIS standard designed for use with the predominant commercially available off-the-shelf GIS and CADD (e.g., Environmental Systems Research Institute ArcInfo and ArcView; Intergraph MGE and GeoMedia; AutoDesk AutoCAD, Map and World; and Bentley MicroStation and GeoGraphics), and relational database software (e.g., Oracle and Microsoft Access). This nonproprietary design, in conjunction with its universal coverage, has propelled the SDS into the standard for GIS implementations throughout the DoD, as well as the de facto standard for GIS implementations in other federal, state, and local government organizations; public utilities; and private industry throughout the U.S. and the world.

The SDSFIE (along with the Facility Management Standards for Facilities, Infrastructure, and Environment [FMSFIE]) is distributed via CD-ROM and the Internet (<http://tsc.wes.army.mil>). A user friendly interactive Microsoft Windows-based software application installs the SDSFIE/FMSFIE “Browser” and “Generator” applications on desktop computers and networks. The “Browser” application provides viewing and printing capability. The “Generator” application generates Structured Query Language code for construction of the GIS database.

The CADD/GIS Technology Center annually updates and expands the SDSFIE. Prior to July 1999, the SDSFIE was known as the Tri-Service Spatial Data Standards and the FMSFIE was known as the Tri-Service Facility Management Standards. The SDS/FMS Release 1.90 and 1.95 were completed in December 1999 and April 2000, respectively. The SDSFIE/FMSFIE Release 2.00 was completed in January 2001.

OBJECTIVE: Establish/maintain Camp Pendleton’s GIS natural resources coverages and databases, ensuring all information is current and meets geoinfo standards and quality controls.

Priority Planned Actions:

- Continue to develop precise and reliable natural resources datasets. Ongoing.
- Semiannually review GIS data to advise resource managers of needs to update datasets during budget planning and programming and in preparation of publishing the semiannual Environmental Operations Map. Ongoing.
- Ensure that standards for GIS database dictionaries and associated metadata for all Camp Pendleton GIS coverages are met. Ongoing.
- Ensure that all contracts with the potential for producing spatial data will include specific language with respect to the production of spatial data that are fully compatible with Camp Pendleton’s GIS database. Ongoing.

- Ensure that the information system support staff responsible for operating and maintaining the system annually obtain focused training regarding current technologies and uses of GIS technology as related to natural and cultural resource management on a military installation. Ongoing.
- Ensure all reports, maps, and data received from contractors and supporting studies and surveys are received in digital versions for addition to GIS and the Document Management System. Ongoing. [Also applies to Section 4.14.3.]
- Evaluate the quality, accuracy, and resolution of mapped environmental data for all coverages. Ongoing.
- Identify, in specific terms, the appropriate use of each data layer based on the quality and resolution of the data source, and whether it is current. Ongoing.
- Require field verification of all data for site specific projects; including soil testing, on-site inventories for sensitive species, etc. Ongoing.
- Every six months, update the Base's Environmental Operations Maps to include the most current species and natural resource data. Ongoing. [Also applies to Section 4.5.1.]
- Establish a database design for each federally listed species, and selected other species as appropriate, to ensure that survey data and summary statistics are comparable from year to year and fulfill requirements for Biological Opinion terms and conditions. 2002.
- Update GIS data layers for natural and cultural resources from various internal and external reports and NEPA documents written for the Base. Clear backlog by 2004.

Other Planned Action

- Digitize, with high-resolution scanning, the historical and ongoing aerial photos of the Base and provide archival storage protection for the original prints. 2002. [Also applies to Section 4.2.3.] **

OBJECTIVE: Maintain operational GPS capability for use with Camp Pendleton's GIS to quickly and accurately map natural resources to provide to biologists, planners, and contractors in an efficient manner.

Priority Planned Actions:

- Ensure all GPS hardware, software, and maintenance agreements are current. Also, ensure these are technologically advanced and capable of withstanding extreme mapping conditions. Ongoing. [Also applies to 4.14.2, third objective.]
- Ensure that all GIS computer hardware, software, peripherals, and maintenance agreements are current. Also ensure that hardware and software are capable of complex computations and manipulations with large data sets, detailed graphics are viewable, and that quality maps and reports can be produced. Ongoing. [Also applies to 4.14.2, third objective.]
- Develop a Standard Operating Procedure for using the GPS unit in the field and for data translation with a software interface that is user friendly for Natural Resources Department personnel. 2002.

OBJECTIVE: Develop new information and products that increase the efficiencies of the planners and managers. Ensure the technically sound, practical, and appropriate use of storage and computer technology to manage, analyze, and communicate natural resource information in support of management decisions.

Priority Planned Actions:

- Seek out and use existing technology and make strategic investments in new technologies and creative, innovative management techniques to address local, regional, or global environmental problems. Ongoing.
- Facilitate better natural resource decisions on Camp Pendleton by improving the capability to access, organize, analyze, and reproduce maps, inventories, remotely sensed data, and other natural resource planning documents. Ongoing.
- Ensure all GPS hardware, software, and maintenance agreements are current. Also, ensure these are technologically advanced and capable of withstanding extreme mapping conditions. Ongoing. [Also applies to Section 4.14.2, second objective.]
- Ensure that all GIS computer hardware, software, peripherals, and maintenance agreements are current. Also ensure that hardware and software are capable of complex computations and manipulations with large data sets, detailed graphics are viewable, and that quality maps and reports can be produced. Ongoing. [Also applies to Section 4.14.2, second objective.]
- Anticipate the need for and seek compatibility with other Base systems, so that land use decisions are coordinated to the greatest extent possible. Ongoing.

- Create a demonstration of data resolution limitations for a range of environmental applications, and the hazards of using multiple map scales. 2002. [Also applies to Section 4.14.1, second objective.]

Other Planned Action:

- Acquire any commercially available GIS products that would enhance Camp Pendleton's GIS database. **

4.14.3 Information Integration: Storage, Access, and Dissemination

Data developed through fieldwork, surveys, and inventories as part of all AC/S ES managed contracts, cooperative agreements, and project specific surveys are incorporated within GIS layers and databases, which allows selection of specific information to be displayed for general basewide, project specific, or training applications.

Natural resource data is made available to the Base community through the publication of three primary maps: the Base Special Training Map, the Natural Resource Map, and the Environmental Operations Map. These maps provide training units and organizations on Base with information regarding the locations and distributions of sensitive species and habitats on the Camp Pendleton. For each environmentally sensitive area depicted on the maps, constraints, restrictions, and guidance are identified.

The Base Special Training Map, published by the Defense Mapping Agency, illustrates general land use and environmental and natural resources on Camp Pendleton at a scale of 1:32,500 (1 inch represents 32,500 feet). While this map is useful as a general reference, it is only revised every few years (the most current version, was revised in October 1997) and the geospatial representation of data is not highly accurate for localized planning. To provide more up-to-date natural resource and land use information for general Base distribution, the AC/S ES IS Branch publishes a Natural Resource Map and an Environmental Operations Map. Revised more frequently than the Base Special Training Map, the Natural Resources Map is printed at a similar scale and is for general planning purposes only. Alternatively, the Environmental Constraints Map is published semiannually, at a larger scale for use in the field (approximately 1:24,000), and in a black and white format for mass copying and distribution. The Environmental Operations Map is the primary natural resource reference map for Range Control, military trainers, Fire Department personnel, and Base managers and planners.

In 1998, efforts continued towards implementation of a shared basewide GIS program. As a cooperative effort, the Base Policy and Technical Workgroups have continued working to establish a framework for the organized, sustainable implementation of GIS technology throughout the Base. Current efforts include establishment of metadata standards in accordance with Executive Order 12906, network connectivity between data partners, and the setting of geospatial data standards.

IS Branch of AC/S ES is in the process of developing an intranet web site to increase access to environmental compliance and natural resources related information. This web site will be used to disseminate environmental guidance, policy, natural resource data, GIS maps, and other information to Base managers and land users.

For non-GIS based data, the ES office is currently developing the organizational capacity and policy for the coordinated management of this resource. Tabular data and text information have historically been managed at the individual AC/S ES staff member or branch level through the use of desktop databases and other software programs. The lack of coordination and an absence of formal ES policy concerning the management of this information have resulted in less than optimal teamwork among branches, decreased efficiencies, a loss of corporate knowledge, and poor project turnover for new or reassigned employees.

One of the projects that Environmental Security has undertaken to improve the storage, maintenance, and accessibility of natural resource management information is the development of a Technical Integrated Information Center (TIIC). This state-of-the-art center is designed to provide virtual library resources for the archiving and retrieval of ES data and documents. The TIIC is still in development stages. One objective of the TIIC program is to provide automated management of all Camp Pendleton environmental documentation for compliance with NEPA and MCO P5090.2A, including Environmental Assessments, Categorical Exclusions, and Environmental Impact Statements.

OBJECTIVE: Establish/maintain a repository of Camp Pendleton's environmental knowledge base and provide accessibility to data and information for biologists, planners, contractors, and others in a quick and timely manner.

Priority Planned Actions:

- Continue development and maintenance of the Technical Integrated Information Center. Ongoing.
- Ensure all reports, maps and data received from contractors and supporting studies and surveys are received in digital versions for addition to GIS and the Document Management System. Ongoing. [Also applies to Section 4.14.2, first objective.]
- Maintain hard and soft copy records of reports, studies, reference materials, and periodicals for environmental inventory. Ongoing.
- Develop (2002) and maintain a natural resources intranet website for access to natural resource data catalog by Base organizations. Ongoing.
- Facilitate distribution of updated Environmental Operations Maps to Base users. Ongoing. [Also applies to Section 4.5.1.]

- Develop a Standard Operating Procedure for the release of GIS data and survey/monitoring results. 2002.

CHAPTER 5

PUBLIC ACCESS, NATURAL RESOURCE RELATED RECREATION, AND EDUCATION

The Marine Corps allows access to natural resources to the extent appropriate and consistent with the military mission, safety and security requirements, and the sustainability of natural resources. Further, it is Marine Corps policy that "...a program for outdoor recreational developments will be created in consultation with the Department of the Interior and appropriate state agency" (HQMC 1998).

Many recreational activities that occur on Camp Pendleton occur within cantonment areas (e.g., fitness centers, swimming pools, bowling allies, tennis courts, athletic fields, concert grounds, and cinemas). However, this plan only covers natural resource related recreational opportunities which are broadly defined to include activities such as hunting, fishing, camping, beach access, hiking, jogging, bicycling, and horseback riding. Recreational activities are only allowed in areas not being used for military training and when security, natural resource and fire conditions allow. The AC/S O&T may close portions of the Base to recreational activities because of security, military training requirements, fires, inclement weather, or wildlife management concerns. In training areas, most recreational activities are limited to weekends and holiday periods to reduce conflicts with training exercises. San Onofre State Park provides public access and recreational opportunities year round in its 4 miles of beach (25% of the Base's coastline) and 2000 acres leased from Camp Pendleton.

DoD bases and stations are authorized to execute cooperative agreements with other state and local agencies or institutions for the exchange of information or conducting research or study projects that will contribute to the installation's integrated natural resources management program. Consultation with state and other federal agencies regarding outdoor recreation plans is an informal process. With the passage of the Sikes Act Improvement Act of 1997, this INRMP now replaces former requirements for a cooperative agreement or plan. Authorizations for issuance of permits and collection of fees for access to natural resource-dependent outdoor recreation were reiterated in the Sikes Act Improvement Act of 1997.

A nominal fee for participation in each program established on Camp Pendleton may be charged under this authorization. Fees or proceeds from these programs are used for management and enhancement of fish and wildlife programs on Camp Pendleton. All recreational activities, including fishing and hunting, at Camp Pendleton are subject to applicable federal laws, state laws, and Base regulations. Legislation and regulations relevant to natural resources related recreation management are summarized in Appendix B.

Outleases and recreation programs on Base provide access to natural resources through a variety of activities for Base personnel and members of the general public. To illustrate the facilities and opportunities available, Table 5-1 presents general categories and the recreational facilities/resources available to each patron.

TABLE 5-1. Camp Pendleton recreational facilities/resources available.

Patron Category	Recreational Facilities/Resources Available
1. Active duty and retired military personnel, Medal of Honor recipients, etc. Family members (spouses, children, and dependent parents) of active duty, reserve, or retired military personnel. This includes surviving spouses, children, and dependent parents of service members who died while on active duty or who were Medal of Honor recipients. Family members of foreign military personnel assigned to the U.S. Armed forces. Employees of the Red Cross and their family members who are required to reside aboard Camp Pendleton. Civilian employees in a temporary duty status who are residing aboard Camp Pendleton. MCCA employees.	Everything.
2. ROTC members, under orders, who are conducting summer training or orientation visits to Camp Pendleton.	Everything except Del Mar and San Onofre Beach Cottages.
3. Civilian employees and visitors to Camp Pendleton (upon approval of the CG or local commander).	Same as General Public.
4. Active duty personnel of the Armed Forces of a foreign nation visiting Camp Pendleton.	Same as General Public with additional access to Retail Division (exchanges, stores, service stations, etc.) and Service Division (video/car rentals, beauty/barber/tailor shops, etc.).
5. Federal employees who work on Camp Pendleton. Family members of federal employees in programs specifically approved by the CG.	Everything except Del Mar and San Onofre Beach Cottages, Retail Division facilities and most Service Division facilities.
6. General Public (civilians unaffiliated with the military and unaccompanied by a Base employee or military affiliate).	<p>Food establishments (such as Subway, McDonalds, etc., not Clubs), vending machines and pay phones.</p> <p>Hunting/fishing, live bands/concerts, museum (by appt), outdoor races (biking, runs, marathons), bicycling (via Old Hwy 101 transit route), self-guided tour.</p> <p>San Onofre State Park, beach and inland hiking, undeveloped camping (Red Beach), bicycling, surfing, beach access.</p>

The program goals, objectives, and planned actions presented in this chapter were developed and prioritized to support Camp Pendleton's approach to public access and natural resource related recreation. Where planned actions support more than one management program objective they are repeated under different subsections within the chapter. Several

organizations on Base are involved in the administration and coordination of different aspects of public access and recreation. These organizations are included in the descriptions of the programs within this chapter.

5.1 PUBLIC ACCESS

Military and nonmilitary agencies and individuals may be granted access to the Base to conduct research, to use training facilities (e.g., for local law enforcement training), for cultural resource related reasons, to go on organized field tours, or for other special purposes such as Scouting events and high school proms. The Consolidated Public Affairs Office publishes a self-guided tour along primary roads of the Base to introduce visitors to historical and ecological points of interest. Special events sponsored or hosted by Base organizations, ranging from the annual rodeo and “mud runs” to outdoor music concerts are open to the general public. However, only natural resources related recreational and educational opportunities on Base are described in this chapter.

Long term access to the Base is granted to public or governmental entities for nonmilitary purposes in the form of real estate agreements, including leases and easements. This has enabled public access to the San Onofre State Park and includes the vehicle transit access provided on the Interstate 5 corridor.

Public access on Camp Pendleton is restricted for the safety of visitors and security, antiterrorism and force protection requirements of Camp Pendleton to ensure the safety of personnel and mission-essential property and resources aboard the Base. Overall access control is implemented through protective measures and specific actions required to reduce vulnerability to known or anticipated terrorist or other criminal attack. These protective measures and actions are implemented by all DoD components in accordance with the Terrorist Threat Condition System (THREATCON). The THREATCON system describes five progressive levels of protective measures required in response to terrorist threats identified through local and national level intelligence community assessments. These five THREATCON levels are:

- **NORMAL** – Applies when a general threat of possible terrorist activities exist but warrants only a routine security posture.
- **ALPHA** – Applies when there is a general threat of possible terrorist activity against personnel and installations, the nature and extent of which are unpredictable.
- **BRAVO** – Applies when an increased and more predictable threat of terrorist activity exists.
- **CHARLIE** – Applies when an incident occurs or intelligence is received indicating some form of terrorist action against personnel and installations is imminent.
- **DELTA** – Applies in the immediate area where a terrorist attack has occurred or when intelligence has been received that terrorist action against a specific location is likely.

At levels above NORMAL security requirements may result in the curtailment of or increased restriction on public access for natural resource programs addressed in this INRMP or other purposes. These restrictions may be basewide or localized as to time, location or activity. THREATCON levels may change at anytime without warning or notification and may not follow sequentially through all five levels.

GOAL: Provide public access to the Base for natural resource related recreational and educational opportunities that are compatible with the military mission and natural resource sustainability.

5.1.1 Public Access Policy and Coordination

Several organizations on Camp Pendleton are involved in the granting of public access to the Base. The role of these organizations and the general policy of such access for nonmilitary functions are described in Base Order 5720.16A (Policies and Procedures for Non-Military Use of Marine Corps Base, Camp Pendleton). The Base organization(s) involved in granting access depends largely upon the location and nature of the activity to occur on Base. In some instances, such as the San Onofre State Park (administered by California State Parks), public access is coordinated through a lease holding agency.

AC/S O&T is the coordinating agency for all military and nonmilitary organizations desiring to use training ranges, training areas, and airspace on Base. AC/S O&T also provides organizations and agencies external to the Base with Base use request forms and procedure instructions upon request.

The AC/S MCCC manages, coordinates and operates recreational activities that are dependent on developed facilities, such as the equestrian facilities, golf course and developed campgrounds. Recreational activities that are natural resources dependent are under the management of the Resource Management Division of AC/S Environmental Security and are administered by the Resources Enforcement and Compliance Branch (game wardens) with assistance from professional staff biologists. AC/S ES serves as the coordinating agency for the use of Camp Pendleton for such natural resources related usage as: grazing, hiking, hunting, fishing, and non developed camping. AC/S ES, in turn, coordinates such activities that involve the use of training lands with AC/S O&T. Public access to MCAS is coordinated through the MCAS Operations Officer. Lastly, the Director of the Consolidated Public Affairs Office serves as the coordinating agency for all use and access of Camp Pendleton by the media.

MCB Camp Pendleton incurs costs, both direct and indirect, when Base facilities, training areas, and ranges are used. It is Base policy that all reimbursable costs be recovered. All nonmilitary organizations are required to have a real estate license to use facilities at Camp Pendleton and, with the exception of those granted waivers of fees by the Commanding General, will be charged a usage fee (BO 5720.16A).

Requests for use of Camp Pendleton facilities by nonmilitary organizations must be received ninety (90) days prior to the first day of the requested activity (BO 5720.16A). Requests for field trips need to be submitted to the Consolidated Public Affairs Office at least 60 days in advance along with proof of liability insurance. Field trip requests are typically limited due to staffing constraints and training area availability.

OBJECTIVE: Improve public awareness of access and the opportunities for access, where compatible with the military mission and natural resource sustainability.

Priority Planned Actions:

- Annually review recreational coordination procedures for use of training areas with recreation program managers and land managers. Ongoing.
- Develop a Camp Pendleton natural and cultural resource presentation to provide information and awareness to new Base personnel, interested community groups, and others. 2002. [Also applies to Section 5.5.]
- Update and complete the Outdoor Recreation Plan. 2003.
- Evaluate the feasibility and desirability of expanding inland/freshwater fishing opportunities to the general public. 2004. [Also applies to Sections 4.4.5; 5.2.2.]

Other Planned Actions:

- Revise and publish an updated “Welcome to Camp Pendleton” flier as needed. *
- Identify opportunities to provide public access to natural resource related activities to demonstrate Camp Pendleton’s success at conserving natural resources. [Also applies to Section 5.5.] *

5.1.2 Real Estate Agreements: Leases, Easements, etc.

Camp Pendleton allows reoccurring use of 28,500 acres (22.8%) of the Base to non military organizations through leases, easements, outgrants, etc. These agreements include easements for public utilities (e.g., SONGS, SDG&E pipelines, and telephone cables); transit corridors (e.g., I-5); leases to public recreational, educational, and organizations (e.g., San Onofre State Park, Boy Scouts of America, and Fallbrook and Oceanside School Districts); and agricultural leases for row crop production, seed collection, and grazing.

OBJECTIVE: Ensure that all real estate agreements are compatible and consistent with Camp Pendleton military mission, natural resources management, and public access policies.

Priority Planned Actions:

- Review all new leases and the renewal of existing leases for compliance with Base natural resource management goals and programs including terms and conditions of USFWS programmatic biological opinions. Ongoing.
- Ensure that Base recreation program managers are involved in the review of any lease involving recreational activities. Ongoing.
- Ensure compliance of lease and easement holders with the terms of their respective real estate agreements. Ongoing.
- Unless granted a waiver of fees by the Commanding General, ensure that the Base receives a fair market use fee for all non DoD use of Camp Pendleton. Ongoing.
- Establish standardized criteria for the length and conditions of long term leases and easements. 2004.

5.2 HUNTING AND FISHING

Camp Pendleton's hunting and fishing program dates as far back as the early 1950s with the development of the *Cooperative Plan for the Conservation and Management of Fish and Wildlife Resources Aboard Camp Pendleton*, signed by DoI, DoD, and CDFG in August 1963.

The Base hunting and fishing program is managed in cooperation with the CDFG and is in compliance with California law and the annual framework established by CDFG. Section 640, Title 14, California Code of Regulations (Management of Fish and Wildlife on Military Lands) and Sections 3450 through 3453 of California Fish and Game Code allow the Base sufficient flexibility in administering its hunting and fishing program to avoid conflicts with military training. The Base has coordinated with the California Department of Fish and Game to revise its deer hunting management approach on Camp Pendleton to improve hunting opportunities. A change in the season opening dates helped to reduce restrictions to hunting area access historically imposed by the high fire danger common during deer hunting season. The result has been excellent military and civilian participation and perennially high hunter success rates. In the case of deer, the Base has maintained rates of deer reproduction and hunter success consistent with the remainder of California. In addition, the Base has traditionally invited the California Fish and Game personnel to participate in conducting helicopter surveys of pre-hunt deer populations.

The AC/S ES Resource Management Division administers the Base hunting and fishing programs. Base biologists review limits established by the state and set quotas at or below those limits. Base game wardens issue permits, check users in and out of areas, collect data on species harvested, and enforce state as well as Base game regulations. Base Hunting and

Fishing Regulations, which are based largely on the states' current regulations, and are published in Chapter 13 of the Base Order P5000.2J (Base Regulations). Base Hunting and Fishing Regulations are subject to change to accommodate training, mission, and environmental concerns and may not be reflected in the most current Base Regulations.

GOAL: Provide mission compatible and ecologically sustainable hunting and fishing opportunities that enhance quality of life for military personnel, dependents, and the public.

5.2.1 Recreational Hunting

Recreational hunting occurs most of the year and includes small/upland game, deer, and waterfowl hunting (Table 5-2). Hunting is allowed over most areas of the Base when not in use for military training. Hunting is not permitted in dud-producing impact areas, most cantonment areas, areas of reduced habitat (e.g., recently burned), and areas with sensitive vegetation and habitat. It is allowed within some non dud-producing impact areas if no training is occurring. Hunting is allowed before and after working hours (0730-1600) on Wednesdays and all day on holidays and weekends in areas not in use for military training.

TABLE 5-2. Hunting seasons on Camp Pendleton.

Species ^a	Dates ^b	Limit
Mourning Dove	1 September to mid-September, and Early November to mid-December	10 per day; 20 in possession
California Quail	mid-October to late January	10 per day; 20 in possession
Band-Tailed Pigeon	mid-December to late-December	2 per day; 2 in possession
Waterfowl	mid-October to late-June	Variable by species
Deer (archery)	October to mid-December	1 per day; 1 in possession
Deer (rifle)	November to early-December	1 per day; 1 in possession
Ground Squirrel	Year round	None
Brush Rabbit and Cottontail Rabbit	1 July to 30 January	5 per day; 5 in possession
Jackrabbit	Year round	None

^a Species may be added to or removed from this list, depending upon resource needs and as long as state and federal hunting regulations are met.

^b Actual dates of hunting periods vary. The Resources Enforcement/Compliance Branch publishes specific dates annually.

The number of hunters allowed in each hunting area is based on the size of the area, vegetation, fire frequency, road access, game species population levels, game warden availability, and/or cumulative harvest for the current season. This allows Camp Pendleton to spread hunter pressure across the Base and avoid too much pressure on any single area and helps to provide a quality hunting experience while better managing game populations.

Hunting is available to active duty military, retired service members, DoD employees, dependents and civilian hunters. In addition to holding a valid state hunting license, hunters must hold a valid Base Hunting Permit, which may be purchased from the Game Wardens. The CDFG typically issues 480 deer tags annually to the Base for the Camp Pendleton Special Hunt (zone G-10). Camp Pendleton determines the distribution of these tags between military and civilian hunters. Additionally, civilian permits for small/upland game species are issued by Camp Pendleton. Hunters with disabilities may coordinate necessary amenities with game warden staff. Staff can assist with the placement of hunters in more accessible areas, provide field chairs, etc. The Base restricts hunting to daylight hours and may limit the take of some species beyond which would otherwise be legally allowed.

Hunters may use firearms (except pistols), crossbows, or bow and arrows, in accordance with all applicable state and base regulations. They are required to check in and check out with the game wardens on a daily basis. This allows the wardens to see each animal taken and obtain detailed data on the species, number, sex, age, and condition of animals harvested; hunter success; and other parameters.

While not a common activity, Camp Pendleton allows hunters to field train hunting dogs with game birds during daylight hours between 1 July and 31 March. Hunters must ensure that the birds are not harmed or killed while training the dogs. All people planning to train hunting dogs on Base must have a CDFG permit and approval from Base game wardens. Hunters who are field training dogs during the hunting season may allow their dogs to practice pointing and flushing wild birds such as California quail (*Callipepla californica*).

OBJECTIVE: Provide a quality, sustainable hunting experience for military and civilian patrons within the constraints of the military mission and capability of the resources.

Priority Planned Actions:

- Submit Camp Pendleton quotas for deer tags, annually to the CDFG for approval. Ongoing.
- Ensure that staff responsible for implementing and enforcing the hunting program obtains training regarding the implementation and enforcement of laws and requirements relevant to hunting and other natural resource/conservation needs on Base. Ongoing.
- Establish informational booklets on game species programs. Update material as needed. 2002. [Also applies to Section 5.5.]

- Develop a Game Management Plan for small game, and upland game species (incorporating fisheries and deer management plans). 2003. [Also applies to Section 4.4.5.]

Other Planned Actions:

- Assess the feasibility and desirability of expanding the hunting program to include additional species. If desirable and feasible, coordinate changes through normal Base staffing procedures and the Base NEPA process. [Also applies to Section 4.4.5.] ***
- Evaluate possible measures for improving training area availability for the hunting program when areas are not in use by military training. *

5.2.2 Recreational Fishing

Fishing opportunities at Camp Pendleton range from surf fishing on authorized beaches to fresh water fishing at a variety of inland locations. Surf-fishing and diving for mollusks, crustaceans, and clams is permitted for military and civilian personnel on the beach area extending from the southern boundary of San Onofre State Park beach to the northern bank of the Santa Margarita River. Fishing from the northern Del Mar harbor jetty is permitted, and clamming is permitted at San Onofre Beach. The general public is allowed surf-fishing privileges. Take, possession, and season limitations of salt water fin fish and invertebrates are based on the CDFG regulations (although the Base may place further restrictions on these regulations for management purposes in the future). Specific fishing locations are provided when a Camp Pendleton Fishing Permit is purchased.

The fresh water game fish species found on Base include black (largemouth) bass (*Micropterus salmoides*), channel catfish (*Ictalurus punctatus*), brown bullhead (*Ictalurus nebulosus*), green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), and black crappie (*Pomoxis nigromaculatus*). Most fresh water species, including the exotic red swamp crayfish (*Procambarus clarkii*), may be taken all year long. The invasive, exotic bullfrog (*Rana catesbeiana*) may also be taken under recreational fishing regulations on Base. Although there are no length restrictions on most of the species, some have maximum takes. Inland fishing may be authorized at Horseshoe Lake, Case Spring ponds, Santa Margarita River (above Stewart Mesa Road in winter months only), Lake O'Neill, Whitman Pond, Pilgrim Creek Pond, Broodmare Ponds, Wildcat Ponds, Windmill Lake, and Las Flores Slough (from I-5 bridge west to the ocean) (Figure 5-1). Fishing is permitted at Pulgas Lake for catch and release only.

Fishing in designated inland ponds is available to active duty military personnel, DoD personnel, retired service members, dependents, and guests when accompanied by a sponsor. The number of military affiliates fishing in upland waters is unrestricted; however, patrons engaged in fishing must have a valid state fishing license. Licenses/permits are required for all persons 16 years of age and older. Currently, the general public is not permitted to

freshwater fish on Base, although the Base may issue Group Fishing Permits to organized groups. The general public is allowed surf-fishing privileges. All fishing participants may be assessed a fee established by the Commanding General.

In addition to compliance with the California Fish and Game laws, Camp Pendleton has restrictions that affect recreational fishing, such as ‘daylight fishing only’ in some areas, at some times, and license requirements at all fishing locations. Fishing at areas in training areas is limited to weekends, established holidays, and days next to holiday weekends when the Base provides multiple days off for military personnel. Inland fishing at Lake O’Neill is available year round and is not typically restricted for reasons pertaining to training. The Resources Enforcement/Compliance Branch stocks Lake O’Neill occasionally with exotic game fish, including largemouth bass, bluegill, black crappie, and channel catfish.

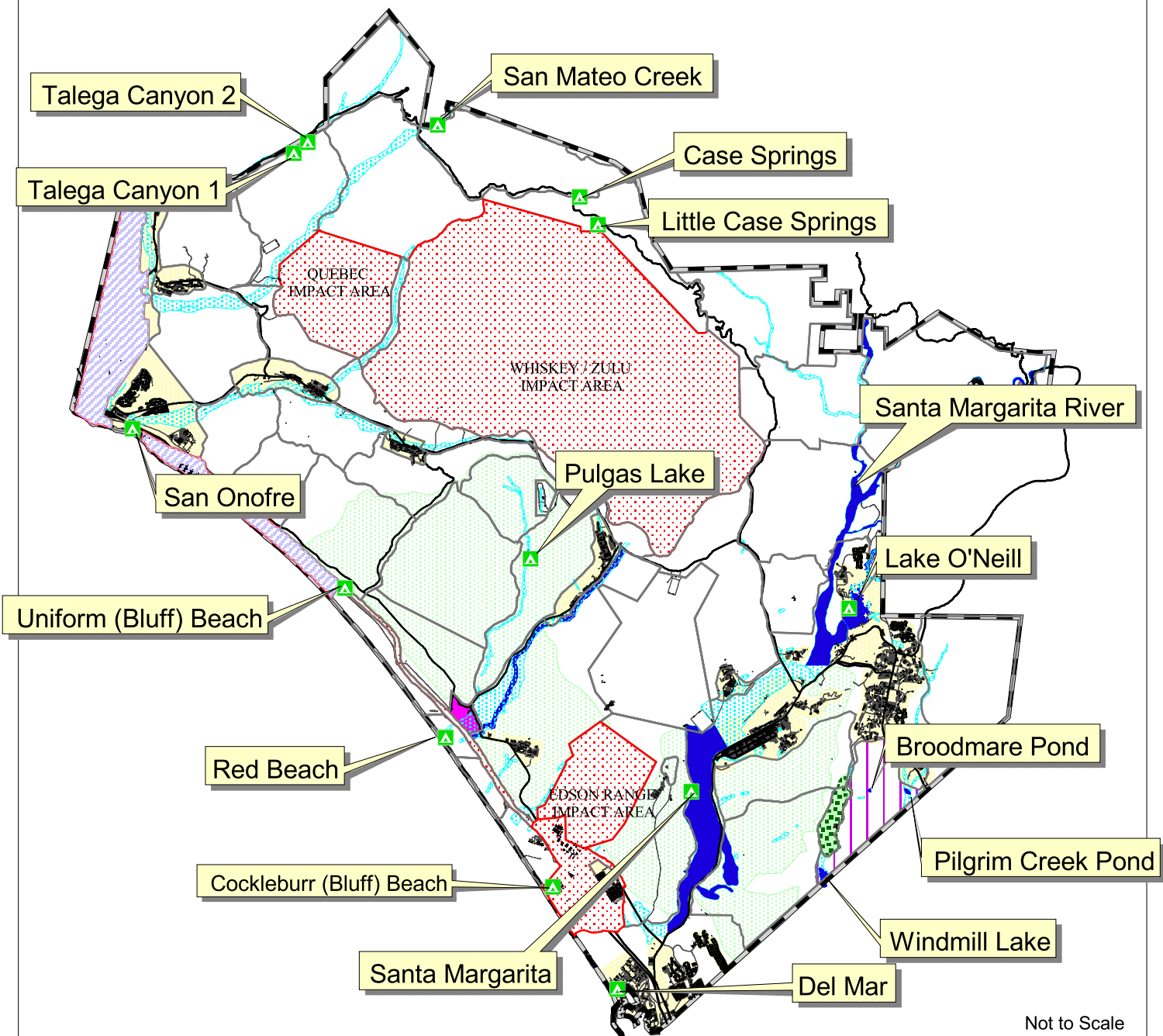
OBJECTIVE: Provide a quality, sustainable outdoor fishing experience for military and civilian patrons within the constraints of the military mission and capability of the resources.

Priority Planned Actions:

- Ensure that staff responsible for implementing and enforcing the fishing program obtain focused training (ideally, at or equivalent to the Federal Law Enforcement Training Center in Georgia) regarding the implementation and enforcement of laws and requirements relevant to fishing on Base. Ongoing.
- Evaluate the feasibility and desirability of expanding inland/freshwater fishing to the general public. 2004. [Also applies to Sections 4.4.5; 5.1.1.]
- Develop a Fisheries Management Plan to address the adverse impacts to Camp Pendleton’s fresh water lakes and ponds from siltation, stagnation, exotic species and aquatic plants. 2005. [Also applies to Section 4.4.5.]

Other Planned Actions:

- Conduct a Comprehensive Freshwater Fisheries Management Study. [Also applies to Section 4.4.5.] ***
- Complete a master plan for recreational and other uses of Lake O’Neill. [Also applies to Section 5.3.1.]**
- Evaluate the feasibility and desirability of installing a low cost/maintenance water quality improvement system for Lake O’Neill. [Also applies to Section 4.4.5.] *



Not to Scale

- Camp Pendleton Boundary
- Training Area Boundary
- Paved Roads & Parking Areas

Hunting/Fishing/Camping

- Open to Hunting of Legal Game Species (All State & Federal Laws Apply, Access Coordinated through AC/S ES, Resource Mgmt. Division)
- Fishing (All State & Federal Laws Apply, Access Coordinated through AC/S ES, Resource Mgmt. Division)
- Camping (Access Coordinated through AC/S ES, Resource Mgmt. Division)

- Restricted (No Hunting)
- Sheep Grazing Lease Areas

Public Access (No Hunting Allowed)

- Buildings, Roads and Parking Areas
- Horse Grazing Pasture
- San Onofre State Park
- Cantonment
- Historical Site
- Golf Course

**Figure 5-1
Recreation and
Public Access**



Map Source:
AC/S Environmental Security
GIS Branch
October 2001



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5.3 OTHER NATURAL RESOURCE RELATED RECREATION

MCB Camp Pendleton offers many natural resource related recreational opportunities beyond hunting and fishing, including developed and undeveloped camping, picnicking, beach and ocean use, equestrian activities, hiking, jogging, races, bicycling, etc.

GOAL: Provide mission compatible and ecologically sustainable outdoor recreational opportunities that enhance the quality of life for military personnel and the general public.

GOAL: Ensure that natural resource related recreation is in compliance with all applicable environmental laws or their implementing regulations.

5.3.1 Camping and Picnicking

The San Onofre State Park has two campgrounds, one inland at the San Mateo section and one in the San Onofre section adjacent to sandstone cliffs. These sites are all open to the general public. The campground in the San Mateo section of the Park has 150 developed sites, showers, and hook ups for trailers and campers. The campground in the San Onofre section of the Park has 221 developed sites with cold, outdoor showers and hook ups for trailers and campers. San Onofre State Park is leased from Camp Pendleton and campsites are managed by the California State Parks. The management of San Onofre State Park campsites is completely separate from the management of campsites on the rest of Camp Pendleton.

Throughout the rest of the Base, developed camping opportunities are available to active and retired military, their dependents, civilian Base personnel, and guests. Cottages and campsites with electrical hook ups and picnic cabanas are available at the Del Mar and San Onofre Beaches. Recreational camping and picnic cabanas are also available at Lake O'Neill. The Lake O'Neill Campgrounds offer tent camping and developed campsites with water, electricity, and sewer hookups. The Lake O'Neill Peninsula is available for large group activities like promotions, retirements, and wedding receptions. This area has picnic cabanas, BBQ grills, a stage, electrical power, and athletic facilities. Bumper boats, paddleboats, and rowboats are available to rent.

Upland camping on Base is undeveloped with no toilets or water provided. Campers are required to obtain an annual camping permit and must coordinate campsite use with the game wardens to verify site availability. Up to 1,000 permits are issued per year on a first come, first served basis. In addition, group camping permits, valid for 4 days (primarily weekends and holidays), may be obtained from the Resources Enforcement/Compliance Branch. Seniors (>65 years old) and patrons with disabilities receive a fifty percent discount on camping fees.

The Resources Enforcement and Compliance Branch designates undeveloped recreational campsites (after coordination with Range Operations) that will not conflict with training

activities or natural resource management objectives. Currently, undeveloped recreational campsites may be available in the following upland locations: Talega Canyon, Uniform Beach bluffs, Pulgas Lake, Case Springs (larger and smaller ponds), and San Mateo Creek (Figure 5-1). Additional campsites occur within riparian and beach areas.

Depending upon location, campgrounds on Base are supervised by MCCA staff, the game wardens from RECB, and/or beach lifeguards. In addition, volunteer night host residing at the beach campgrounds assist with after hours supervision of those areas.

OBJECTIVE: Provide for a quality, sustainable camping and picnicking experience for military and civilian patrons within the constraints of the military mission and capability of the resources.

Priority Planned Actions:

- Promote the ‘undeveloped’ camping program to a maximum of 1,000 annual permits. Ongoing.
- Ensure patron awareness of, and compliance with, Base Order P11320.13D (Fire Protection Regulations and Instructions) regarding campfires, use of stoves, etc. Ongoing.
- Evaluate the potential costs, benefits, and feasibility of reestablishing recreational camping opportunities in the Cocklebur bluff area. If desirable and feasible, coordinate changes through normal Base staffing procedures and the Base NEPA process. 2003.

Other Planned Actions

- Complete a master plan for recreational and other land uses of Lake O’Neill. [Also applies to Section 5.2.2.] **
- Evaluate the feasibility and desirability of establishing an agreement with the State Park to use campsites in the State Park when Base sites are occupied. *

5.3.2 Beach and Ocean Use

Camp Pendleton's land holdings include approximately 17 miles of beachfront; 40% of which is managed primarily for recreation by the Base or California State Parks. The leased acreage comprising the San Onofre State Park features approximately 4 miles of sandy beaches with six access trails from the bluffs above. It includes the famous “Trestles” surfing beach. The State Park provides public access year round and activities in the Park are administered by State Park personnel. The Park is popular with hikers, campers, swimmers,

and surfers. Nature observers may see whales, dolphins, and sea lions offshore. Birdwatching is primarily at the marshy area where San Mateo Creek meets the shoreline at Trestles Beach. The State Park has two campgrounds and a nature trail that starts at San Mateo Canyon and leads to San Mateo State Preserve/Trestles Beach.

In addition to the beach leased to and administered by the State Park, the Base administers Del Mar Beach and marina (at the southern end of the Base) and San Onofre Beach (to the north). Miles of recreational beach are accessible at these locations to active and retired military, their dependents, civilian Base personnel, and guests. Both beaches have cottages and campsites with electrical hook ups, picnic cabanas, and recreational equipment. Each beach has a bathhouse and lifeguards are on duty year-round. Del Mar and San Onofre beaches are open to the general public on July 4th every year as part of Independence Day celebrations.

OBJECTIVE: Provide for quality, sustainable recreational beach access for military and civilian patrons within the constraints of the military mission and capability of the resources.

Priority Planned Actions:

- Ensure all beach managers and lifeguards receive training with regard to the implementation and enforcement of environmental laws and regulations. Ongoing. [Also applies to Section 4.3.3.]
- Complete a master plan for recreational and other land uses of Del Mar Beach. 2004.

Other Planned Actions:

- Evaluate the level of unauthorized recreational usage of the beach and the potential impacts. If needed, develop possible solutions. [Also applies to Section 4.3.3.] ***
- Maintain the high level of quality of services at Del Mar and San Onofre Recreation Beach. Improve landscaping among the rental cabanas. **
- Limit expansion of waterfront activities at all MCCA beaches and focus efforts towards improving existing programs and facilities. [Also applies to Section 4.3.3.] **
- Develop a master plan for recreational and other land uses of San Onofre Beach. [Also applies to Section 4.3.3.] **

5.3.3 Equestrian Program

The Base Stables provide equestrian activities for active and retired military personnel, their dependents, civilian Base personnel, and sponsored guests. Patrons may board horses, take riding lessons, and go on trail rides. The stables also host annual horse shows and professional rodeo events that are open to the general public. Patrons may ride horses along 15 miles of designated hillside and prairie trails. In addition, with prior clearance from the Resources Enforcement/Compliance Branch, horseback riders may use other areas of the Base. Associated with the stables are two pastures for horse grazing, pens and stalls for boarding the horses, three riding rings for training, and the rodeo grounds. The larger pasture is approximately 1,309 acres and covers much of the Lima training area. The smaller pasture, 123 acres, is adjacent to the stables. The rodeo grounds have established rings, pens, bleachers, etc. as well as associated undeveloped camping and parking sites (for trailering in animals).

OBJECTIVE: Provide quality, sustainable recreational equestrian opportunities for military and civilian patrons within the constraints of the military mission and capability of the resources.

Priority Planned Actions:

- Work with horse stable management personnel to minimize potential impacts on natural resources along horse riding trails. Ongoing.
- Evaluate horse grazing and prepare a plan to ensure the sustainability of the resources and the avoidance and minimization of adverse impacts to federally listed species. 2003. [Also applies to Section 4.10.1.]

5.3.4 Hiking, Jogging, and Bicycling

Recreational hiking and jogging are generally permissible throughout the Base for active duty military, retired service members, DoD employees, and dependents. However, impact areas, restricted areas, range firing and hunting areas when in use, areas closed to protect wildlife, and/or areas where troops are training are restricted. About once a month organized races are held on Base roads and trails, including the annual “Mud Run” (a 10-km route of rugged terrain, training obstacles, deep water, and mud) and “Ridge Run” (a 5 km route along steep terrain). The Base allows hikers to use primary and secondary roads, fire breaks, and designated hiking trails for recreational hiking and jogging subject to the above mentioned restrictions. Hikers must notify the game wardens and receive authorization to enter training areas prior to use on weekends and holidays.

Recreational biking on Base is only permitted for active duty military, retired service members, DoD employees, and dependents on established roads and trails, except for MCCS sponsored race events which are open to the general public. Bicycle riders must notify the

game wardens and receive authorization prior to entering any training area. Members of the general public may use the established bicycle transit corridor during daylight hours without prior authorization as a means of bypassing Interstate 5 between Oceanside and San Clemente. The San Onofre State Park also permits cyclists on established trails.

OBJECTIVE: Provide quality, sustainable hiking, jogging, bicycling, and races for military and civilian patrons within the constraints of the military mission and capability of the resources.

Priority Planned Actions:

- Identify and develop fitness walking, jogging, and running routes and maps for military personnel. 2003.

Other Planned Actions:

- Develop a brochure on Base hiking routes. **
- Identify and develop bicycling routes and maps for military personnel. **
- Explore the feasibility of charging a permit fee for natural resource tours, hikers, bicycling, and photography. **
- Develop hiking opportunities in the San Mateo, Talega, and DeLuz areas. *
- Explore the feasibility of a bicycle rental program through MCCS in cooperation with a community bicycle shop. *

5.4 NONMILITARY OFF ROAD VEHICLES

Nonmilitary off road vehicles are not authorized on Camp Pendleton. The term “off road vehicle” refers to any motorized vehicle designated for, or capable of, cross country travel on, or immediately over, land, water, sand, ice, marshes, swampland, or other natural terrain (HQMC 1998; EO 11644). Such activity is not considered consistent with the Base’s mission. This recreational use of the land frequently conflicts with military land use requirements, wise land management practices, environmental values, and other recreational activities. The restrictions of nonmilitary off road vehicle do not apply to official use by an employee, agent, or designated representative of the federal government or one of its contractors (EO 11644).

OBJECTIVE: Eliminate unauthorized, nonmilitary off road vehicle travel.

Priority Planned Actions:

- Review damage caused by unauthorized off road travel and incorporate into planned restoration efforts and routine maintenance. Ongoing. [Also applies to Section 4.7.2, first objective.]

Other Planned Actions:

- Repair perimeter fences and limit unauthorized access. ***

5.5 ENVIRONMENTAL EDUCATION

The importance of educating Base residents, visitors, and the surrounding communities about Camp Pendleton's unique natural resources, stewardship initiatives, and contributions to regional conservation goals cannot be overstated. As far back as the early 1970's Camp Pendleton played host to many organizations and provided numerous group tours and lectures to the southern California Chapter of the Soil Conservation Service, San Diego County Agriculture Department, the University of California Davis School of Agriculture, and annual CDFG regional managers meetings. Other Base environmental awareness efforts included sponsoring Los Angeles Zoo field study classes on southern California reptiles, a University of California Riverside class on range grasses, SDSU students' master theses (e.g., oak woodlands), an Orange Coast College study on San Onofre Beach erosion and ecology, a University of California Los Angeles and USDA study on soils, plus many outdoor programs for youth group activities, school events, and Boy and Girl Scouts camp outs.

At present, environmental staff on Base conduct frequent slide presentations on natural resources and Base management programs to a variety of on-Base and off-Base groups such as conservation organizations, service groups and college classes. Base personnel also lead field trips to observe wildlife and discuss Base management programs. Events include an annual tour for the Friends of the Santa Margarita River and meetings conducted by the Biodiversity Research Consortium, National Research Council, and several regulatory agencies.

An objective of community outreach and educational programs has been, and continues to be, proper public environmental awareness and recognition of DoD stewardship. Awareness is accomplished through interpretive signs and programs, nature trails, and viewing areas. Interpretive signs and programs provide an opportunity to communicate natural resource information and value to users and visitors of Camp Pendleton. Special interest areas, such as where military activities are highly visible along I-5 and historic sites, offer a setting for education and orientation of the public. Access to cultural sites, however, must be limited to prevent vandalism.

To generate and celebrate environmental awareness and spread the message of support for environmental protection, Camp Pendleton annually participates in Earth Day events. For example, during 1998, a major Earth Day celebration was held on Base that involved live displays of native reptiles, birds and a variety of mammals that occur on Base. News articles are prepared periodically for the Base paper and interviews are given frequently to local newspapers. Staff also participates with local high schools in a School-to-Career program, orienting students monthly to the environmental compliance and natural resource management profession.

In addition, MCAS Camp Pendleton is organizing community participation in the nationally observed Arbor Day celebrations that encourage tree planting and tree care. Arbor Day celebrations are held in communities all over America, with the date determined by the best tree planting times in each area. Although traditionally Arbor Day is celebrated on the last Friday of April, in California, Arbor Day is celebrated within the week of March 7-14.

Although not an annual event, MCAS Camp Pendleton convened a symposium on conservation and management of the arroyo toad in the Fall of 2000 to (1) facilitate interaction and sharing of information regarding arroyo toad life history and management practices, (2) share information on the latest arroyo toad research, (3) identify future research needs, and (4) enhance toad and breeding habitat identification skills. More than 120 people attended the event, including representatives from six governmental agencies, academia, consultants, and interested citizens.

For land users and personnel on Camp Pendleton, the Environmental Training Branch within Environmental Security and the MCAS Environmental Department conduct periodic training needs assessments and coordinate the environmental education and training programs. The Environmental Training Branch prepares and presents education and training materials, conducts the senior commanders symposiums, and delivers the unit operations and logistics officers (S3 and S4) training program. This Branch also tracks all environmental training programs being conducted on Base, and ensures all training materials and course content meet or exceed quality standards, as established by Marine Corps Headquarters and Camp Pendleton's Commanding General.

The Environmental Training Branch is guided by the United States Marine Corps' Comprehensive Environmental Training and Education Program (CETEP). Devised in 1992, CETEP is a Headquarters Marine Corps sponsored program that was approved at the highest levels by both the USMC training (CG, MAGTEC) and environmental (Deputy Chief of Staff, Installations and Logistics) functional commands. CETEP was designed to incorporate the development and program management aspects of the USMC Systems Approach to Training (SAT) and principles of Total Quality Leadership (TQL) into a program and program-development process to address the environmental training challenge Marine Corps-wide. The ultimate goal of CETEP is to ensure that appropriate environmental instruction and information are provided at all levels of the Marine Corps in the most effective manner to achieve full compliance with all environmental training requirements.

The five major components of CETEP are:

1. General environmental awareness training for all,
2. Marine Corps job specific training for all Marine Corps personnel,
3. Environmental information for Commanding Generals/Officers,
4. Training for environmental professionals,
5. Assess environmental training needs and evaluate the adequacy of training policies and programs to meet those needs.

Educational and training programs at Camp Pendleton serve as proactive measures to prevent violations of natural resource related laws and regulations. A natural resources orientation program for new personnel is under development that will include: (1) a short presentation on natural resources, (2) emphasis on the importance of protection of federally listed threatened and endangered species and archeological and historical resources, and (3) a reminder about Camp Pendleton's policy prohibiting off road vehicle activity that is not specifically authorized, including mountain bikes. Training programs will include educating existing and future Base personnel about natural resources and use of this INRMP.

The Mission Resource Conservation District under contract with the Riverside County Flood Control District provides elementary school education programs for watershed and stormwater awareness on Base. When Camp Pendleton obtains a Phase II municipal stormwater permit, it will likely contribute to the funding of this program as one of its best management practices under that permit.

OBJECTIVE: Provide natural resource awareness/education opportunities for military and civilian patrons on Base. Improve Base residents and regional awareness of the unique natural resources on Camp Pendleton, stewardship initiatives, laws and regulations, and natural resource related recreational and educational opportunities.

Priority Planned Actions:

- Participate in Earth Day celebrations with an exhibition or gathering at MCAS and the development of educational outreach programs for local schools. Ongoing.
- Participate in off-Base Earth Day celebrations with an exhibition and develop educational outreach programs for local schools. Ongoing.
- Commemorate Arbor Day with the ceremonial planting of trees. Ongoing.
- Establish informational booklets on game species programs. 2002. Update materials as needed. [Also applies to Section 5.2.1.]
- Develop interpretive facilities at the RV campsite south of the Santa Margarita River estuary and other campsites as appropriate. 2002.

- Develop a Camp Pendleton natural and cultural resource presentation to provide information and awareness to new Base personnel, interested community groups, and others. 2002. [Also applies to Section 5.1.1.]

Other Planned Actions:

- Install or replace interpretive signs describing significant natural resources at additional locations. ***
- Update and reissue the Camp Pendleton environmental awareness and information video. ***
- Develop an interpretive area focusing on Santa Margarita River habitat. **
- Develop low-impact interpretive facilities at San Onofre recreation beach. **
- Develop low-impact interpretive opportunities at Lake O'Neill, possibly including an environmental awareness trail around the lake. **
- Identify opportunities to provide for public access to natural resources to demonstrate Camp Pendleton's success at conserving natural resources. [Also applies to Section 5.1.1.] *

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ACRONYMS AND ABBREVIATIONS

ac	acre(s)
ACE	Automated Compliance Evaluation
AC/S	Assistant Chief of Staff
ACOE	Army Corps of Engineers
AFA	Artillery Firing Areas
AGL	Above Ground Level
Base	Camp Pendleton
BASH	Bird Air Strike Hazard
BMP	best management practice
BO	Biological Opinion or Base Order
BWSC	Base Water Steering Committee
CADD	Computer-Aided Design and Drafting
CAL	Confined Area Landing
CAS	Close Air Support
CDFG	California Department of Fish and Game
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CETEP	Comprehensive Environmental Training and Education Program
CFR	Code of Federal Regulations
cfs	cubic feet per second
CG	Commanding General
CIA	Central Impact Area
CMC (LF)	Commandant of the Marine Corps
COMCAB(WEST)	Commander Marine Corps Air Bases (Western Area)
CPAAA	Camp Pendleton Amphibious Assault Area
CPIF	California Partners in Flight
CPLO	Community Planning and Liaison Office
CTT	Combat Training Town
CWA	Clean Water Act
CX	Categorical Exclusion
DEPT./Dept.	Department
DDT	dichlorodiphenyltrichloroethane
DIV./Div.	Division
DoD	Department of Defense
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction
DoI	Department of the Interior
DoN	Department of the Navy
EA	Environmental Assessment
ECE	Environmental Compliance Evaluation
ECPSOP	Environmental Compliance and Protection Standard Operating Procedures
EE	Environmental Engineering (Division)
e.g.	<i>exempli gratia</i> (for example)
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency

MCB & MCAS Camp Pendleton, California

ES	Environmental Security
ESA	Endangered Species Act
et al.	<i>et alii</i> (and others)
<i>et seq.</i>	<i>et sequentes</i> (and the following)
etc.	<i>et cetera</i> (and so forth)
F	Fahrenheit
FAA	Federal Aviation Administration
FAC	Facilities
FDR(S)	Fire Danger Rating (System)
FMD	Facilities Maintenance Division
FMP	Fire Management Plan
(FMS)FIE	(Facility Management Standards) for Facilities, Infrastructure, and Environment
FSSG	Force Service Support Group
ft	foot (feet)
FY	Fiscal Year
GIS	Geographic Information System
GPS	Global Positioning System
ha	hectare(s)
HMMV	High Mobility Multipurpose Vehicle
HOLF	Helicopter Outlying Landing Field
HQMC	Headquarters, U. S. Marine Corps
HW	hazardous waste
I	Interstate
ICRMP	Integrated Cultural Resource Management Plan
i.e.	<i>id est</i> (that is)
IGMC	Inspector General of the Marine Corps
IR	Installation Restoration
IS	Information Systems (Branch)
ISS	Installation Security and Safety
IMEF	First Marine Expeditionary Force
INRMP	Integrated Natural Resources Management Plan
LAAD	Low Altitude Antiaircraft Defense
LAND	Land Management (Branch)
LCAC	Landing Craft Air Cushion
LFAM	Live Fire and Maneuver
LHA	Assault Amphibious Ship
LTETM	Long Term Ecological Trend Monitoring
LZ	Landing Zone
MAG	Marine Air Group
MAGTEC	Marine Air Ground Training and Education Compliance
MAPS	Monitoring Avian Productivity and Survivorship
MarDiv	Marine Division
MAW	Marine Aircraft Wing
MBTA	Migratory Bird Treaty Act
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCCS	Marine Corps Community Services
MCO	Marine Corps Order
MCTSSA	Marine Corps Tactical Systems Support Activity
MEB	Marine Expeditionary Brigade

METL	Mission Essential Task List
MFA	Mortar Firing Area
MHCOSP	Multiple Habitat Conservation and Open Space Program
MHCP	Multiple Habitat Conservation Planning
mi ²	square miles
MILCON	Military Construction
MOU	Memorandum of Understanding
MOUT	Military Operations in Urban Terrain
MP	Mortar Position
MSCP	Multiple Species Conservation Plan
MSHCP	Multiple Species Habitat Conservation Plan
MSL	Mean Sea Level
mybp	millions of years before the present
N/A	not applicable
NAVFACENGCOM	Naval Facilities Engineering Command
NBC	Nuclear, Biological, and Chemical
NCCP	Natural Communities Conservation Program
NCTD	North County Transit District
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
no.	number
NOV	notice of violation
NR	Natural Resources (Department)
O&T	Operations and Training
OICC	Officer in Charge of Construction
OWR	Office of Water Resources
pers. comm.	personal communication
PI	Programmatic Instructions
PIF	Partners in Flight
PLANNING	Environmental Planning (Branch) or Resource Planning (Division)
PMO	Provost Marshal's Office
PMR	Program Management Review
POA&M	Plan of Action and Milestones
ppt	parts per thousand
PWD	Public Works Department
PWO	Public Works Officer
RCD	Resource Conservation District
RCHCA	Riverside County Habitat Conservation Agency
RCIP	Riverside County Integrated Planning
RCRA	Resource Conservation and Recovery Act
RECB	Resources Enforcement and Compliance Branch
RM	Resource Management (Division)
ROD	Record of Decision
ROICC	Resident Officer in Charge of Construction
RSOP	Reconnaissance, Selection, Occupation of Position (non-firing AFAs)
RV	recreational vehicle
SAIA	Sikes Act Improvement Act
SANDAG	San Diego Association of Governments
SARA	Superfund Amendments and Reauthorization Act
SAT	Systems Approach to Training

MCB & MCAS Camp Pendleton, California

SDG&E (SDS)FIE	San Diego Gas and Electric (Spatial Data Standards) for Facilities, Infrastructure, and Environment
SDSU	San Diego State University
SECNAV	Secretary of the Navy
SERDP	Strategic Environmental Research and Development Program
SMER	Santa Margarita Ecological Reserve
SMSLR/WMA	Santa Margarita and San Louis Rey Rivers Watershed Management Area
SOCTIIP	Southern Orange County Transportation Infrastructure Improvement Program
SONGS	San Onofre Nuclear Generating Station
sp(p)	species (plur.)
SWDIV	Southwest Division, Naval Facilities Engineering Command
SWP	Strategic Water Plan
TBD	To Be Determined
T&C	Terms and Conditions
TCA	Transportation Corridors Agency
TDS	Total Dissolved Solids
TERF	Terrain Flight
THREATCON	Terrorist Threat Condition System
TIIC	Technical Integrated Information Center
TNC	The Nature Conservancy
TNT	trinitrotoluene
TQL	Total Quality Leadership
UCMJ	Uniform Code of Military Justice
U.S.	United States
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USMC(B)	U.S. Marine Corps (Base)
UST	Underground Storage Tank
VERTREP	Vertical Replenishment
V/STOL	Vertical/Short Take Off and Landing
WACO	Western Area Regional Counsel Office
WILDLIFE	Wildlife Management (Branch)
WREC	Western Regional Environmental Coordinators (Office)

GLOSSARY

Adaptive management: Management that acknowledges uncertainty, values science-driven experimentation to test assumptions and predictions, learns from experience, and strives to improve future management actions.

Battalion: A tactical military unit typically consisting of a headquarters company and four companies or a headquarters battery and four artillery batteries; the size of a battalion may reach up to approximately 1,200 personnel. (See also *company*, *platoon*, *squad*.)

Best management practices (BMP): Within the scope of this INRMP, BMP's are practical, economical, and effective management or control practices that will reduce or prevent water pollution or adverse impacts to natural resources. BMP's are applied as a system of practices based on site-specific conditions rather than a single practice. BMP's are usually prepared by state or federal agencies for land-disturbing activities related to agriculture, forestry, and construction.

Biodiversity (biological diversity): The variety of living organisms (species) within an ecosystem and the genetic differences within and among these organisms.

Candidate species: Any species being considered by the Secretary of the Interior or Commerce under the ESA for listing as an endangered or threatened species, but not yet proposed for listing.

Central Impact Area (CIA): Dud-producing impact areas, collectively including the Quebec, Whiskey, and Zulu training areas. (See also *dud-producing impact area*, *secondary impact areas*.)

Community: The assemblage of different species at a particular time and place. (See also *ecosystem*, *population*.)

Company: A subdivision of a military regiment or battalion; the size of a company may reach up to 140 to 170 personnel, but is generally closer to 140. (See also *battalion*, *platoon*, *squad*.)

Conserve/conservation: Planned management and protection of natural and cultural resources to provide sustainable use and continued benefit for present and future generations, and the prevention of exploitation, destruction, waste, and/or neglect. The use of all methods necessary to bring a threatened or endangered species to the point at which the Endangered Species Act is no longer needed. Outside of the Endangered Species Act, conservation means human efforts to protect natural resources from wasteful practices and to assure a resource base for future generations.

Consultation: A structured, analytical process required by the Endangered Species Act and its implementing regulations. A federal agency makes certain determinations about the impact of their actions on listed species. Thereafter, the federal agency submits its

information and conclusions to the United States Fish and Wildlife Service for review and comment. Consultation under these circumstances is not always cooperative.

Corridor: Landscape elements that connect similar patches of habitat through a dissimilar matrix or aggregation of patches.

Critical habitat: For listed species consists of: (1) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of Section 4 of the Endangered Species Act, on which are found those physical or biological features (constituent elements) (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of the Act, upon a determination by the Secretary that such areas are essential for the conservation of the species. (USFWS & National Marine Fisheries Service 1998)

Cumulative effects: Cumulative effects are those effects of future state or private activities, not involving federal activities that are reasonably certain to occur within the action area of the federal action subject to consultation. [50 CFR§402.02] This definition applies only to Section 7 analyses and should not be confused with the broader use of this term in the NEPA or other environmental laws. (USFWS & National Marine Fisheries Service 1998)

Cumulative impact: A NEPA term that refers to impacts that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Direct effects: Effects caused by an action and which occur at the same time and place as the action. (See also *indirect effects*.)

Disturbance: Any event that alters the structure, composition, or function of terrestrial or aquatic habitats or directly or indirectly affects species.

Driver: A need that must be satisfied for the Base's mission to continue without disruption (e.g., the need to be in compliance with laws and regulations, the need for beach access for amphibious landings, the need for fire management) (HQMC 2000). (See also *event*.)

Dud-producing impact area: Dud-producing impact areas support the delivery of ground-to-ground and air-to-ground ordnance and may contain unexploded (dud) ordnance. Dud-producing impact areas include the Quebec, Whiskey, and Zulu impact areas, often referred to collectively as the Central Impact Area. (See also *Central Impact Area*.)

Ecoregion: A continuous geographic area with similar climate that permits the development of similar ecosystems on sites with similar properties.

Ecosystem: A dynamic and natural complex of living organisms interacting with each other and with their associated nonliving environment. (See also *community*, *population*.)

Ecosystem management: A goal-driven approach to managing natural and cultural resources that supports present and future mission requirements; preserves ecosystem integrity; is at a scale compatible with natural processes; is cognizant of nature's timeframes; recognizes social and economic viability within functioning ecosystems; is adaptable to complex and changing requirements; and is realized through effective partnerships among private, local, State, tribal, and Federal interests. Ecosystem management is a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are a part of the whole.

Endangered species: A species of fauna or flora that has been listed by the USFWS or the NMFS for special protection and management under the ESA.

Endangered Species Act (ESA): The 1973 Endangered Species Act provides for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend, both through federal action and by encouraging the establishment of state programs. The Act:

- authorizes the determination and listing of species as endangered and threatened;
- prohibits unauthorized taking, possession, sale, and transport of endangered species;
- provides authority to acquire land for the conservation of listed species, using land and water conservation funds;
- authorizes establishment of cooperative agreements and grants-in-aid to states that establish and maintain active and adequate programs for endangered and threatened wildlife and plants;
- authorizes the assessment of civil and criminal penalties for violating the Act or regulations; and
- authorizes the payment of rewards to anyone furnishing information leading to arrest and conviction for any violation of the Act or any regulation issued thereunder.

Section 7 of the Endangered Species Act requires federal agencies to insure that any action authorized, funded or carried out by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat.

Endemic species: Species that occur naturally in a certain region and whose distribution is limited to a particular locality.

Enhancement: The improvement of the physical and biotic characteristics of habitat such that natural processes and productivity are augmented.

Event: An incident (e.g., hazardous waste spill) or a driver (e.g., legal requirement) that may or may not lead to the establishment of one or more projects. (See also *driver*, *projects*.)

Exotic Species: Species that occur in a given place, area, or region as the result of direct or indirect, deliberate or accidental introduction of the species by human activity.

Firebreak: Any natural or constructed barrier bladed or disced to bare earth and used to segregate, stop, and control the spread of fire. (See also *fuelbreak*)

Fragmentation: Division of a large land area (e.g., forest) into smaller patches isolated by areas converted to a different land type.

Fuelbreak: A natural or constructed barrier that includes mowed or modified vegetation and is used to segregate, slow, and control the spread of fire or provide a control line from which to work. Fuelbreaks are wider than firebreaks and are not designed to completely stop a fire like a firebreak; rather fuelbreaks allow more time for the fire's heat to dissipate before reaching the firefighter. (See also *firebreak*)

Habitat: An area where a plant or animal species lives, grows, and reproduces, and the environment that satisfies its life-cycle requirements.

Harm: An act that actually kills or injures wildlife. Such acts may include significant habitat modification or degradation when it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering. (USFWS & National Marine Fisheries Service 1998)

Harass: An intentional or negligent act which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering.

Hazardous materials: Defined under the U.S. Department of Transportation (DOT) regulations (Title 49 CFR Parts 106 through 178) as chemicals that are determined by the Secretary of Transportation to present risks to safety, health, and property during transportation. The DOT regulations include requirements for shipping papers, package marking, labeling, and transport vehicle placarding. Specific sections of the federal regulation address shipment by rail, aircraft, vessel, and public highway.

Hazardous substances: Defined by the CWA and CERCLA as chemicals that are harmful to aquatic life or the environment and are regulated if spilled or otherwise released to the environment. EPA has designated reportable quantities for each of the hazardous substances. If more than the reportable quantity of a hazardous substance is released to the environment, you are required to clean up the spill and report it to the appropriate regulatory agency. If less than the reportable quantity is released, you are still required to clean up the spill, but no report is required. Spill of oil and other petroleum products are also regulated under the CWA when spilled in areas where they will or eventually could enter waterways.

Hazardous wastes: Defined and regulated by RCRA as amended by the Hazardous and Solid Waste Amendments (HSWA) of 1984. Under RCRA, a waste is considered hazardous if it meets certain levels of reactivity, ignitability, corrosivity, toxicity, or is listed as a hazardous waste in Title 40 CFR Part 261. Currently there are about 450 listed wastes. In general, RCRA regulations address the day-to-day management of these wastes. In comparison, the cleanup of past waste disposal sites is principally regulated under CERCLA.

Home range: The area visited by an organism during the course of daily activity.

Hypothesis: An assertion or working explanation that leads to testable predictions; an assumption providing an explanation of observed facts, proposed in order to test its consequences.

Incidental take: Take of listed fish or wildlife species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the federal agency or applicant. [50 CFR §402.02] (See also *take*.)

Indirect effects: Effect caused by an action and which occurs later in time or farther removed in distance from the action. Indirect impacts include:

- (1) Growth-inducing effects.
- (2) Effects related to induced changes in the pattern of land use, population density, or growth rate.
- (3) Related effects on the human environment, including the natural and physical environment. (See also *direct effects*.)

Integrated Natural Resources Management Plan (INRMP): An integrated ecosystem management plan showing the interrelationships of individual components of natural resources management (fish and wildlife, forestry, land management, and public access) to mission requirements and other land use activities affecting an installation's natural resources.

Isolated ephemeral wetlands: Temporary bodies of water formed where there are depressional landscape features that do not readily drain and rainfall is variable. (See also *pool, vernal pool, wetlands*.)

Listed species: A species determined by the United States Fish and Wildlife Service to be either threatened or endangered, and that determination has been documented through a public notification process that includes publishing the finding in the Federal Register, and inclusion of the species in the lists maintained in the Code of Federal Regulations.

Migratory bird: Any avian species listed in Title 50 Code of Federal Regulations, Section 10.13.

Mitigation: Measures taken to offset potential adverse biological effects from activities that may have impacts to listed upland species. Mitigation can include repairing, rehabilitating, or restoring the affected resource; reducing or eliminating the effect over time by preservation and maintenance operations during the life of the action; and/or compensating for the effect by providing substitute resources or environments.

Mitigation banking: Actions taken to compensate for future adverse effects of undertakings by providing substitute resources or environments in advance of any specific undertaking.

Monitor: To collect or record information that is descriptive of conditions over time. In project development, monitoring is used to evaluate whether or not objectives of a project

and its mitigation plan are being realized. In land management, monitoring is used to describe continuous or regular measurement of conditions that can be used to validate assumptions, alter decisions, change implementation, or maintain current management direction.

Multiple use: The integrated, coordinated, and compatible use of natural resources so as to achieve a sustainable yield of a mix of desired goods, services, and direct and indirect benefits while protecting the primary purpose of supporting and enhancing the military mission and observing stewardship responsibilities.

National Environmental Policy Act (NEPA): NEPA is the basic national charter for the protection of the environment. It establishes policies, sets goals, and provides means for carrying out environmental policy. NEPA requires decision makers to consider the environmental consequences of an applicable action before making the decision to take the action. For certain actions, NEPA requires decision makers to open the decision making process to public scrutiny and involvement.

Native: Indigenous; living naturally within a given area.

Natural: Substantially unaffected by human activities.

Natural resources: All elements of nature, including both physical and biological components.

- (1) Physical Resources: Nonliving resources such as mineral and soil components.
- (2) Biological Resources: Living resources such as plants and animals.

Non dud-producing impact area: Non dud-producing impact areas, referred to collectively as “secondary impact areas,” support training activities that utilize small arms firing and the use of non dud-producing ordnance in live fire exercises. Secondary impact areas are scattered across the Base and include Edson Range, X-Ray Impact Area, 409 Impact Area, and Firing Ranges 312A (currently inactive), 313A (currently inactive), and 403 located within the Juliett Training Area (Figure 3-2). Upon request, maneuver activities may be conducted within secondary impact areas. (See also *secondary impact area*.)

Other Planned Actions: Those actions that the Camp Pendleton desires to accomplish, but due to restrictions and limitations on fiscal and personnel resources cannot commit to undertaking at this time. Other Planned Actions are identified for implementation as funding and resources permit and their delay is unlikely to cause management problems or failure to meet goals or mission support requirements.

Patch: Ecosystem elements (such as areas of vegetation) that are relatively homogeneous internally and that differ from what surrounds them.

Permanent impact: Impacts to resources that persist through time (e.g., from development projects). Impacts that involve population or habitat changes that are irreversible. (See also *temporary impact*.)

Plan: A guidance document that may or may not consist of one or more projects or programs (e.g., Erosion Control Plan, Fire Management Plan, MCB Camp Pendleton Masterplan, USFWS recovery plans). (See also *program, project, recovery plans*.)

Platoon: A subdivision of a military company usually consisting of squads or sections; the size of a platoon may reach up to approximately 40 personnel. (See also *battalion, company, squad*.)

Pool: Any depression in the land (including road ruts) with ephemeral ponded water, including but not limited to vernal pools, puddles, potholes, and road ruts. (See also *isolated ephemeral wetlands, vernal pool, wetlands*.)

Population: A group of individuals of the same species occurring within the same general location that is geographically separated (or physically isolated) from other such groups. With this biologically based definition, more than one population of the same species may occur on Base; likewise, only a part of a larger population may occur on Base. (See also *community, ecosystem*.)

Population (occupied habitat) threshold: The species population size (which may be measured by amount of occupied habitat) below which the Base will meet with the Service to discuss probable cause(s) of decline and necessary remedial actions to facilitate the species population recovery. (See also *occupied habitat*.)

Population viability: Relative measure of the estimated numbers and distribution of reproductive individuals in a species population necessary for that species' continued existence; a minimum number of reproductive individuals in a habitat that will both support them and enable them to interact is necessary for a species' maintenance (adapted from 36 CFR 219.9).

Priority Planned Action: Actions that Camp Pendleton has committed to accomplish; and/or are required by laws, regulations, and/or other agreement. Priority Planned Actions were developed to: (1) achieve Camp Pendleton's natural resource management goals, (2) incorporate the principles of ecosystem management in all programs, and (3) support the military operational and support requirements of the Base.

Program: A group or series of related projects (e.g., fire management). A program may be an informal grouping of projects or formalized in a plan (e.g., Fire Management Plan). (See also *plan, project*.)

Project: An action or activity that may be implemented. (See also *program, plan*.)

Proposed Species: Any species of fish, wildlife, or plant that is proposed in the Federal Register to be listed under section 4 of the ESA.

Recovery plans: Plans developed by the USFWS for listed species that provides specific management objectives to facilitate the recovery of the species. Recovery plans typically include a listed species' life history and current status, habitat requirements and availability, factors which limit the species survival, conservation measures currently in place, and specific management objectives that will facilitate recovery of the species.

Restoration: Reestablishment of the physical and biotic characteristics of habitat such that critical functions are restored.

Secondary impact areas: Non dud-producing impact areas, including Range 409, Edson Range, and the X-Ray Impact Area. Unlike the Central Impact Area, secondary impact areas are scattered throughout the Base and can be used for ground-based training activities. (See also *Central Impact Area, non dud-producing impact area*.)

Sensitive resources: Those resources identified as “highly responsive or susceptible to modification by external agents or influences.”

Seral stage: The developmental stages of a plant community, not including the climax community; typically, young-seral forest refers to seedling or sapling growth stages; mid-seral forest refers to pole or medium sawtimber growth stages; and old or old-seral forest refers to mature and old-growth stages.

Significant resources: Those resources identified as “having special importance,” or as “having or likely to have more influence on a particular aspect of the environment than other components.”

Species: Any population or group of populations of organisms that are capable of interbreeding freely with each other but not with members of other species.

Squad: The smallest unit of military personnel; a subdivision of a military platoon. (See also *battalion, company, platoon*.)

Stakeholders: Tribal, state, county, local governments, and private landholders as well as individuals and groups representing local and national interests in federal land management. This is meant to be inclusive of all organizations and individuals with an interest in federal lands.

Stewardship: The management of resources entrusted to one's care in a way that preserves and enhances the resources and their benefits for present and future generations.

Succession: The more or less predictable changes in species composition in an ecosystem over time, following natural or human disturbance. An example is the development of a series of plant communities (called seral stages) following a major disturbance.

Sustainability: The ability to maintain ecological processes and functions, biological diversity, and productivity over time.

Take: To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct toward, a federally listed (threatened or endangered) species. [ESA §3(19)] (See also *incidental take*.)

Temporary impact: Impacts to listed species and their habitat that do not persist through time. Impacts that involve population or habitat changes that are reversible. Examples of activities on Base that are considered to cause temporary impacts include ongoing training, maintenance, and recreation. (See also *permanent impact*.)

Threatened species: Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. [ESA §3(20)]

Vernal pool: Shallow, ephemeral wetlands with very specific hydrologic characteristics, occurring within a Mediterranean climate region, but only within soil types where there is a seasonally perched water table. A vernal pool is a type of isolated ephemeral wetland. (See also *isolated ephemeral wetlands, pool, wetlands*.)

Waters of the United States: This term applies to the jurisdictional limits of the Army Corps of Engineers under the Clean Water Act, as defined in 33 CFR 328, and includes all waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters subject to the ebb and flow of the tide. Also included are all interstate waters, interstate wetlands, and all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, wet meadows, playa lakes, or natural ponds.

Watershed: The region draining into a river, river system, or body of water.

Weed: Any plant growing where it is not wanted.

Wetlands: Lands where saturation is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Common terms used to describe various wetlands include “marshes,” “bogs,” “swamps,” “small ponds,” “sloughs,” “potholes,” “vernal pools,” and “wet meadows.” (See also *isolated ephemeral wetlands, pool, vernal pool*.)

Wildland Fire: Any non-structure fire that occurs in the wildland.

Wildlife: Wildlife are living, nondomesticated animals. Federal wildlife policy promotes both the production of certain wildlife for hunting and the conservation of other wildlife facing extinction.

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Final

**CULTURAL RESOURCES INVENTORY
AND SURVEY REPORT
FOR THE
NAVAL WEAPONS STATION (WPNSTA)
SEAL BEACH, DETACHMENT FALLBROOK, CA**

Submitted to:

**U.S. Department of the Navy
Southwest Division
Naval Facilities Engineering Command
1220 Pacific Highway
San Diego, CA 92132-5187**

Navy Contract Number: N68711-98-M-5752

Prepared for:

**Naval Weapons Station (WPNSTA),
Seal Beach, Detachment Fallbrook**

Prepared by:

**Mooney & Associates
9903 Business Park Avenue
San Diego, CA 92131-1120**

**Theodore G. Cooley, M.A.
Senior Archaeologist**

Confidential - Restricted Distribution

May 2000

Acres: Approximately 5,800

U.S.G.S. Quadrangles: Morro Hill, Fallbrook, and Bonsall 7.5'

Key words: Phase I Archaeological Inventory Survey; San Diego County; Naval Weapons Station (WPNSTA), Seal Beach, Detachment Fallbrook; 2 historic sites; 53 prehistoric and 2 prehistoric/historic sites, including 42 milling station sites; and 4 habitation sites with bedrock mortar features; 10 isolates; Cottonwood Triangular biface fragments; Brown Ware ceramics; 1930s cement cattle troughs

Integrated Natural Resources Management Plan

Naval Ordnance Center
Pacific Division
Fallbrook Detachment

December 1996

4.7 SITE 32, PAINT SHOP DISPOSAL AREA BY BUILDING 351.

From the mid-1950s to 1983, waste caustic soda solution was discharged to the ground behind Building 351 (see Figures 4-1 and 4-3). A 6'x3'x4' tank located on the southwest side of Building 351 contained about 50 gallons of caustic soda (sodium hydroxide) and was used to loosen the paint from painting tools, rollers, and trays. The items were placed in the tank, removed, and then hosed off on an area next to the tank. During the IAS on-site visit, about ten square feet of soil colored with paint sludge was visible next to the tank.

About once every six months, approximately 50 gallons of waste caustic soda solution containing paint sludge was drained from the tank. A 15- to 20-foot long pipe, perpendicular to the tank, drained the waste caustic soda solution down the hill behind Building 351. About 1977, a perforated seepage drum was installed at the pipe outfall. Waste caustic soda solution drained into the drum and then seeped into the surrounding soil. About 2,800 gallons of waste caustic soda solution with paint sludge were discharged to this area. (8-57)

Potential contaminants at both locations are heavy metals, such as lead, which may have been present in the paint formulations.

Conclusions. Agree with EPA and DHS recommendations for further work. A Site Inspection under the Navy Installation Restoration Program is warranted for the paint shop disposal area due to the possibility of heavy metal contamination from the paint sludge.

Recommendations. Soil samples should be collected near the tank and in the vicinity of the pipe outfall. The soil samples should be analyzed for CAM metals and pH.

4.8 SITE 33, SALVAGE YARD LANDFILL BY BUILDING 307.

From 1952 until the early 1960s, an area of approximately two acres located northeast of Building 307 (see Figure 4-1) was used to dispose of inert materials. Approximately 10,000 cubic yards of materials, mostly metal, was disposed at Site 33. From 1952 to 1955, an ammunition belting operation in Building 307 generated empty 20mm and 40mm ammunition cans and excess ammunition clips. The empty ammunition cans were stacked on pallets and temporarily stored in the salvage yard adjacent to Building 307. Following temporary storage, the cans were smashed with a bulldozer, transported by dump truck to the landfill and buried. The ammunition clips were also disposed of at the landfill. Inspection of Site 33 during the on-site survey revealed other inert material in the disposal area. These materials included electronic parts, inert missile parts, rubber missile shipping rings, Bullpup missile test stands, practice shapes electronic test equipment, empty powder cans, metal banding, and tires. Reportedly, in 1966 or 1967, about two pounds of five partially-filled cans of smokeless powder was deposited in Site 33. (8-58)

Conclusions. Agree with EPA and DHS recommendations for further work. A Site Inspection under the Navy's Installation Restoration Program is warranted for the Salvage Yard Landfill. Although there was no known disposal of hazardous wastes at the landfill, there is the possibility of co-disposal of hazardous wastes with the inert materials.

Recommendations. Ground water monitoring wells should be installed in the vicinity of the site using a fracture-trace study to determine the well locations. Ground water sample analyses should include tests for priority pollutants, substituting CAM metals for priority pollutant metals. The Explosive Ordnance Demolition (EOD) team from San Diego should be contacted concerning the five partially-filled cans of smokeless powder.

4.9 SITE 34, DUNNAGE DISPOSAL AREAS.

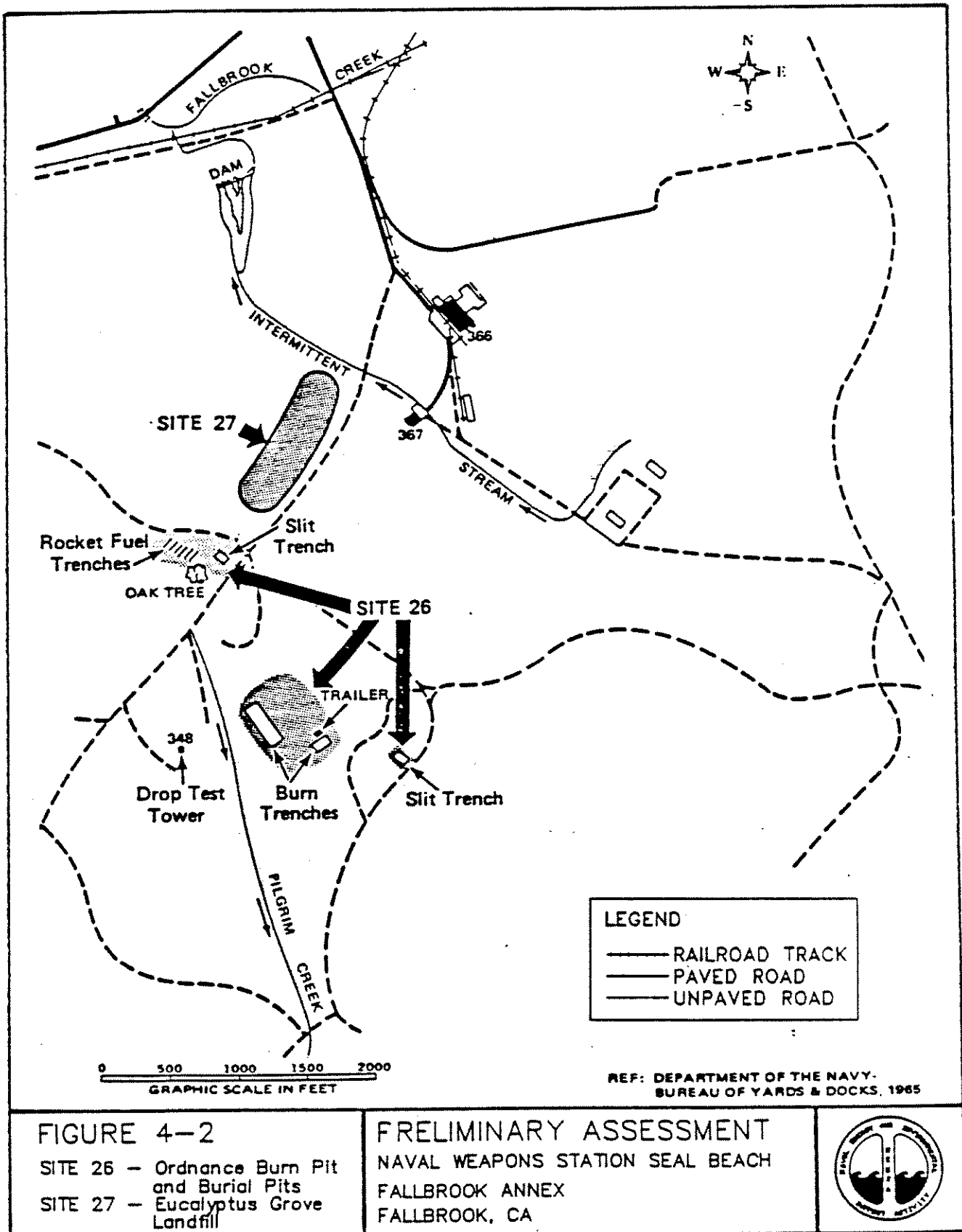
From about 1942 to about 1978, five areas (Areas A, B, C, D, and E) consisting of ravines, were filled with inert dunnage (see Figures 4-1 and 4-3). From about 1960 to about 1978, metal banding was the primary material disposed of in the ravines. Prior to 1960, metal banding was not used in ammunition shipments. Other inert material disposed of included wood pallets. Most of the wood pallets disposed of at Site 34 were not treated with pentachlorophenol (PCP). Table 4-1 is a list of materials disposed of at Site 34. (8-58)

Conclusions. Agree with EPA and DHS recommendations for further work. Disagree with DHS recommendation for further study. Site 34 does not warrant further study since no hazardous materials were disposed of at the site.

Recommendations. No further action under the Navy Installation Restoration Program is recommended.

4.10 SIGNIFICANT FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS FOR SITE 52, NAPALM CANISTER STORAGE AREAS.

In the early 1970s, Fallbrook Annex began receiving Air Force napalm canisters for staging before shipment to Vietnam. After the resolution of U.S. involvement in Vietnam, napalm shipments on their way to Vietnam were brought back to the Fallbrook Annex for storage. A total of 35,000 napalm canisters packaged in wooden crates were brought to Fallbrook Annex. Some of the wooden crates were treated with pentachlorophenol (PCP).



Return to Eike Honradl

ADDENDUM TO THE
PRELIMINARY ASSESSMENT
(INITIAL ASSESSMENT STUDY)

OF

NAVAL WEAPONS STATION
SEAL BEACH, CALIFORNIA

PART I - NWS SEAL BEACH
PART II - FALLBROOK ANNEX

Prepared by:

JILL REICHLE
JED COSTANZA

ENVIRONMENTAL PROTECTION DEPARTMENT
NAVAL ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY
CODE 112E3

PORT HUENEME, CALIFORNIA 93043-5014

NEESA 13-062A
AUGUST 1990

CHAPTER 4 SIGNIFICANT FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The following re-evaluates the sites at Fallbrook Annex included in the 1985 Initial Assessment Study (IAS) of Naval Weapons Station (NWS) Seal Beach (NEESA 13-062). The following also evaluates an additional site, Site 52, Napalm Canister Storage Areas, which was added to this Preliminary Assessment at the request of NWS Seal Beach in Commanding Officer, NWS Seal Beach letter Ser 0923 of 5 Sep 89. All references noted by page numbers in parentheses refer to the IAS of NWS Seal Beach (NEESA, 13-062) unless otherwise noted as author and date in parentheses.

4.1 SITE 26, ORDNANCE BURN PITS AND BURIAL PITS BY THE DROP TEST TOWER, BUILDING 348.

From 1942 to the early 1970s, low order ordnance burning was conducted in two trenches in an area adjacent to Building 348 (Figures 4-1 and 4-2). The depth and width of both trenches were about 10 to 15 feet and the lengths were about 150 feet and 300 feet. Each trench consisted of three or four pits. Burning was conducted in a pit for an unknown period of time; the pit was then covered with soil, and a new pit dug for future burning. The smaller trench, southeast of the larger trench, was dug in 1967 and was used less frequently than the larger trench. Ordnance burned at Site 26 included smokeless powder left over from powder surveillance samples, defective or average smokeless powder, and Explosive-D (ammonium picrate). Smokeless powder and Explosive-D were poured in long, thin, powder lines around the edge of the burn pit and ignited. An estimated total of 130,000 pounds of smokeless powder and 70 pounds of Explosive-D were burned at Site 26. Disposal of additional wastes included small quantities of station refuse, practice shapes (inert dummy bombs), pallets (potentially treated with pentachlorophenol), ash from the incinerator (Building 316), and signal flares containing white phosphorous. Station refuse consisted of spent silica sandblast grit with paint chips, rags with solvent residue, empty paint cans with paint residue, and used paint brushes. All of these wastes were ignited with gasoline or diesel fuel and burned in the burn trench pits. In 1977, the entire burn trench area was graded.

During the IAS on-site visit, flare canisters, pieces of powder cans, missile parts, and brass parts were found in the burn trench area of Site 26.

From 1942 to the early 1970s, pyrotechnics (flares with expired shelve lives) and items too large to burn in the incinerator (Building 316) were burned in slit trenches (Figure 4-2). Three slit trenches were cut into bedrock and roofed with Quonset huts. Each trench was approximately 12 feet wide by 25 feet long, with varying depths. The slit trench, located on the east side of

Site 26, was about 15 feet deep, and the slit trench on the west side was about 5 feet deep. The depths of the remaining trenches are unknown. The first slit trench used began in 1942 and is located in the area west of the two burn trenches. The Quonset hut roof of this slit trench became burned, warped, and then collapsed. Station personnel completely collapsed the roof and covered the trench with soil.

Reportedly, the bulk of pallets disposed of on station were not treated with pentachlorophenol (PCP) and were probably burned in the slit trenches. Reportedly, pallets were PCP-dipped only if they were destined for overseas shipments. During the IAS on-site visit, unburned pallets were observed piled in the two remaining slit trenches that were not covered with soil.

In 1982, ten flat-bed truckloads of pallets with crystal line coating were burned in a pit near the drop test tower (Building 348). Reportedly, a special pit was dug for this burn and personnel at the burn site were told that the pallets were not dipped with wood preservative.

On 6 January 1969, 142 pounds of MAP-4 amine fuel (a mixture of unsymmetrical dimethylhydrazine and diethyltriamine) and 423 pounds of inhibited red-fuming nitric acid (liquid rocket component) were poured into and buried in separate pits northwest of the burn trench area (NAVWPNSTA Seal Beach, 1972) near the large oak tree. The pits were covered with soil following disposal. During the IAS on-site visit, no stressed vegetation or bare spots in the soil were observed in this area. (8-52)

Conclusions. Agree with EPA and DHS recommendations for further work. A Site Inspection under the Navy Installation Restoration Program is warranted since hazardous materials were disposed of at the burn and burial pits.

Recommendations. Ground water monitoring wells should be installed in the vicinity of the site using a fracture-trace study to determine the well locations. Ground water sample analyses should include tests for priority pollutants, substituting California Assessment Manual (CAM) metals for priority pollutant metals; total petroleum hydrocarbons; picramic acid; and picric acid.

4.2 SITE 27, EUCALYPTUS GROVE LANDFILL NEAR BUILDING 366.

Site 27 was the station landfill from the late 1960s to 1974 when Fallbrook Annex began contracting refuse disposal off station. Site 27 is located approximately 700 feet southwest of Building 366 (Figures 4-1 and 4-2). The site encompasses an area of approximately 1000 feet by 300 feet and was approximately four feet deep. About 20 to 23 dumpsters of refuse a week were disposed of at the landfill. The total volume of refuse in the landfill is about 24,000 cubic yards. Small quantities of hazardous wastes were disposed of with the refuse. Types of hazardous wastes included empty paint cans with dried paint

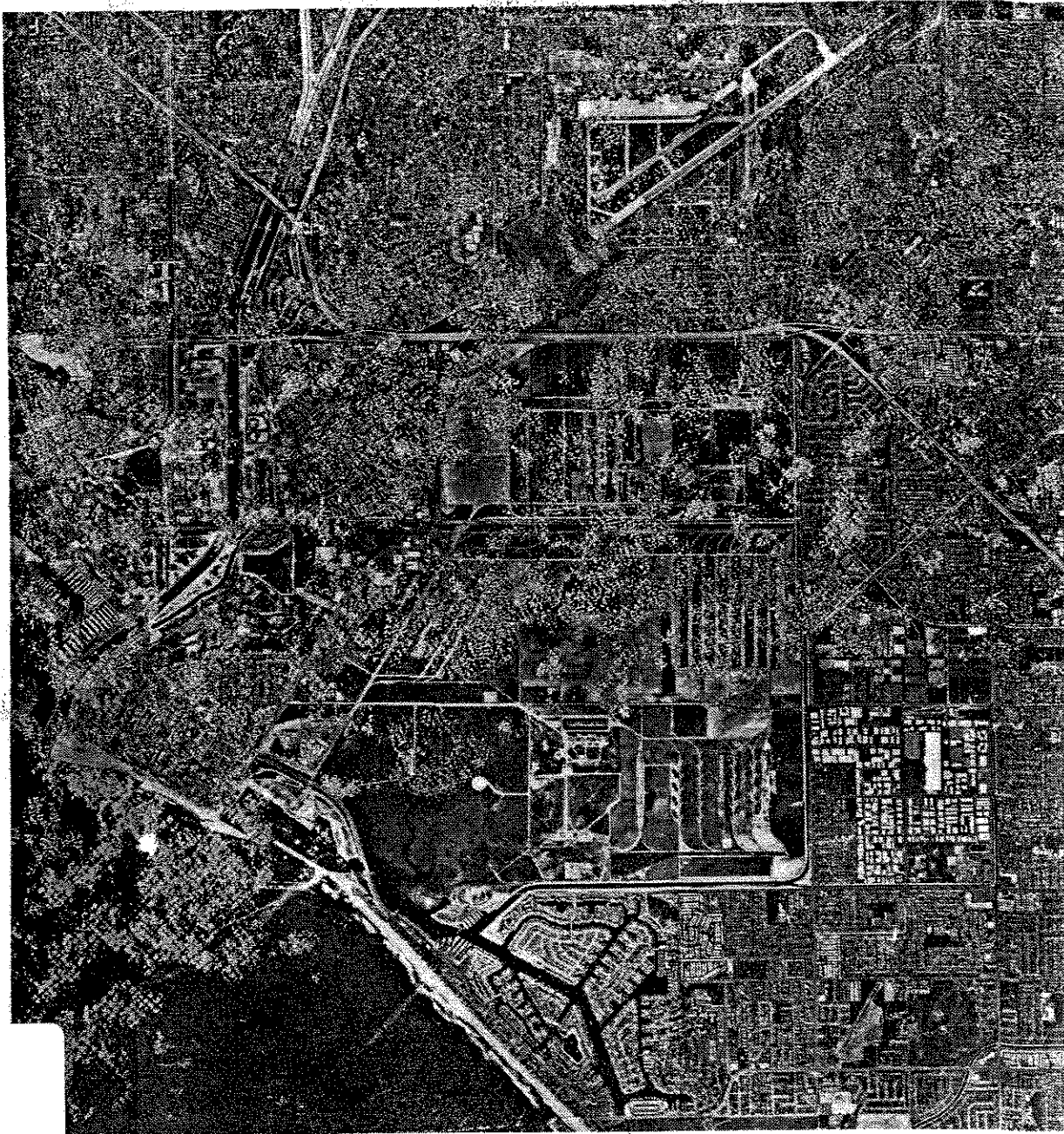
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LAND USE COMPATIBILITY STUDY

FOR

NAVAL WEAPON STATION, SEAL BEACH

AN ENCROACHMENT STUDY



VA
70
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L36
1985

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Source:
NHC-NL

**LAND USE COMPATIBILITY STUDY
FOR
NAVAL WEAPONS STATION, SEAL BEACH
(An Encroachment Study)**

Prepared for:

Department of the Navy
Western Division
Naval Facilities Engineering Command
P.O. Box 727
San Bruno, California 94066

September 1985

Mary
Item 10

BUREAU OF ORDNANCE

Selected Ammunition Depots

Volume I

- CONV. IN. ☐
- CONV. OUT ☐
- ADD. IN ☐
- ADD. OUT ☐
- TEMP. IN ☐
- TEMP. OUT ☐
- STAMPING: ☐
- HISTORICAL ☐
- VERIFICATION ☐
- TOOL ☐
- WORK ☐
- BLANK ☐
- INSTRUMENTS: ☐
- IMPRINTS: ☐
- NOISE ☐

SPECIAL INSTRUCTIONS:

INSTRUMENTS:

First Draft Narratives
Prepared by the Historical Section,
Bureau of Ordnance

E. C. KALFON,
 Admiral, U.S.N. (Ret.),
 Director of Naval History.

Source NHC-NC

This copy for

Building the Navy's Bases in World War II

**History of the Bureau of Yards and Docks
and the Civil Engineer Corps
1940 - 1946**

Volume 1

**UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON
1947**

Source: NHCWL

CHAPTER 13

THE AMMUNITION DEPOTS

For ten years preceding the second World War nine ammunition depots had, with a fair degree of adequacy, met the Navy's modest peace-time needs for the storage and care of ammunition ashore. Eight of the depots were at coastal points, or near the coast, in close geographical relation to navy yards; the ninth was far inland. Although the coastal depots were congested, the great explosion at Lake Denmark in 1926 had demonstrated the hazards in concentrated storage, and progress was being made in the direction of dispersal. The inland depot, at Hawthorne, Nev., had ample room. The total amount of material to be stored and handled was not great, for its rate of expenditure in target practice and other training operations was, in comparison with subsequent war expenditures, almost negligible.

The programs of national defense and war construction beginning in 1940 brought about a gigantic expansion of this portion of the Navy's shore establishment. The old coastal depots had their facilities expanded to the limit of their safe capacity and twelve new major stations, more generously provided for in the matter of land area, were built at points inland and on the Atlantic, Pacific, and Gulf coasts. The Hawthorne inland depot was expanded tremendously and three other major inland depots were added. To meet the prodigious demands for ammunition by a fleet actively engaged in a war in distant waters, four great new shipping facilities were provided; and five new coastal depots were developed to make possible the necessary ammunition service to important operating bases.

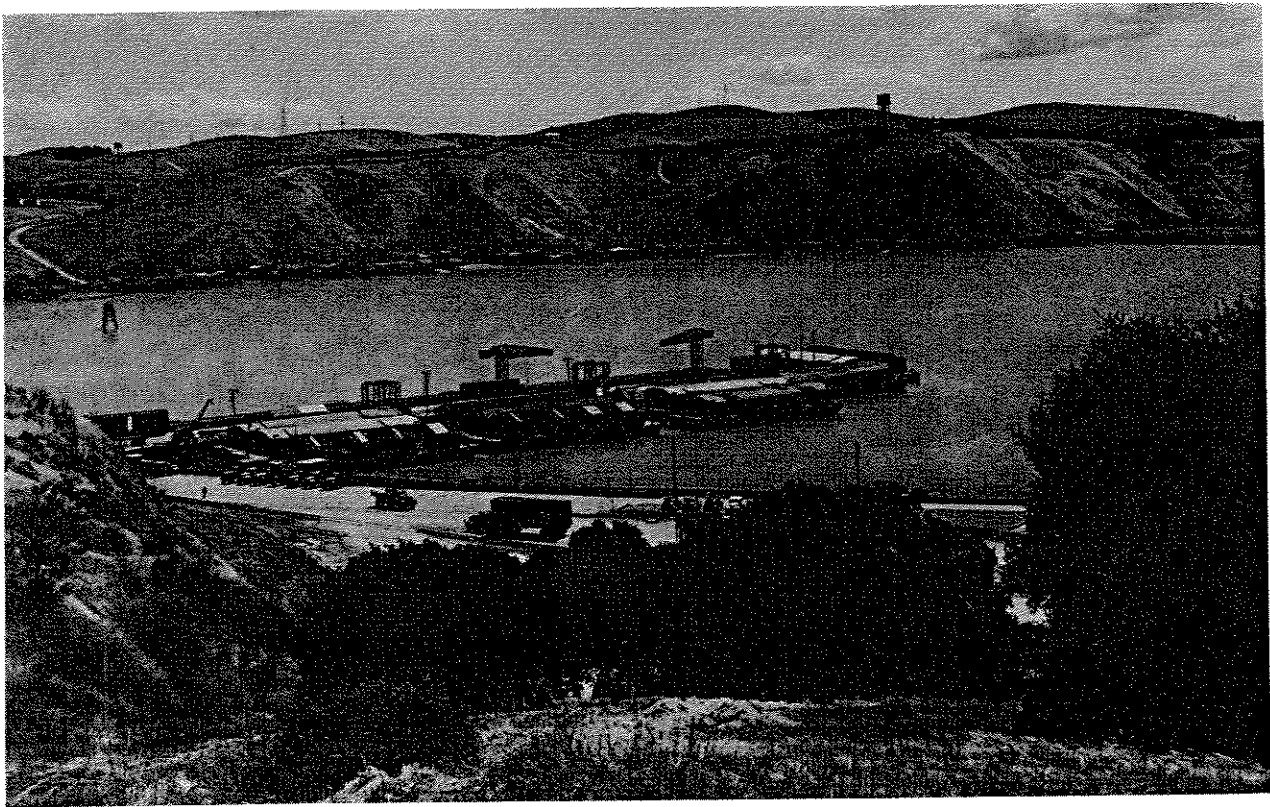
Under the Navy's peacetime practice, each combat unit of the fleet was provided at the time of its commissioning with enough ammunition to fill its magazines, and, in addition, a reserve supply was stored ashore. Periodically, much of this ammunition had to be overhauled, an operation involving the removal of all explosive material and the refilling with new, and the checking of all mechanical

parts. The nature of the overhaul operation was such that it was feasible of accomplishment only at a well-equipped shore station. As safety considerations demanded that a combat ship have its magazines emptied before coming into a navy yard, convenience suggested that the ammunition depots, equipped to store the reserve supply and the magazine ammunition and to conduct the overhaul operations, be located in close proximity to the yards.

On the East Coast, the naval ammunition depot at Hingham, Mass., was only 12 miles away from the Boston Navy Yard, across Boston Harbor. The New York area had two depots, one at Iona Island, N. Y., 45 miles up the Hudson River, devoted primarily to industrial activities, and one at Lake Denmark, N. J., 50 miles northwest of the yard by rail, serving principally as a storage depot. For Philadelphia there was the Fort Mifflin depot, across the Schuylkill River from the navy yard. The St. Juliens Creek depot, 3 miles up the Elizabeth River from the Norfolk Navy Yard, was part of the important Hampton Roads operating area. In addition, at Yorktown, Va., there was a large mine depot, which will be discussed in this chapter as roughly equivalent to an ammunition depot.

On the West Coast, two important ammunition depots served the San Francisco Bay and the Puget Sound naval bases. The Mare Island depot occupied the southeastern tip of the island, no more than a mile from the heart of the navy yard. The Puget Sound depot was 5 miles away from the Bremerton yard, on the shores of Ostrich Bay.

East of the Sierra Nevada, 375 miles by rail from the San Francisco Bay area, was the newest ammunition depot, at Hawthorne, Nev., well located to support the depots at Mare Island and Puget Sound. It was the only depot within the United States that was up to date in design, for its very existence could be attributed to a disastrous explosion at one of the older depots which had brought in its train a revolutionary change in ammunition stowage practices.



LOADING PIER FOR AMMUNITION, MARE ISLAND AMMUNITION DEPOT

One of two such piers built during the war program to supplement an older one, which had until that time been the only Navy-owned ammunition pier in the San Francisco Bay area.

The disaster had occurred at the Lake Denmark depot in 1926. During the first World War that depot's storage capacity had been greatly expanded to what was even then considered the absolute limits of safety, and at the time of the catastrophe it was fully loaded with ammunition left over from the war. One Saturday afternoon, while an electrical storm was raging, fire broke out in one of the magazines. It set off a series of explosions which destroyed or badly damaged all the buildings on the station. The explosions were followed by fires which raged for a week through smokeless-powder magazines, shell houses, service buildings, and woods.

A painstaking study of the disaster led to drastic revision of the prevailing practices in providing storage facilities for ammunition. Wide dispersal became the new key note. The amount of ammunition that could be stored as a unit was drastically curtailed, and the allowable distance between those units was sharply increased. For example, under

the revised policy no more than 143,000 pounds of high explosive could be stored in a single magazine, and magazines had to be at least 500 feet apart; at Lake Denmark there had been one building containing 1,691,000 pounds of TNT, and 80 feet away, another containing 789,400 pounds. New design specifications also were drawn up for magazines, ruling out the use of combustible materials and materials which had demonstrated a low resistance to explosion and a tendency to fragmentation.

Revision of all the ammunition storage facilities in accordance with the new criteria became an immediate objective, but it involved a large program of reconstruction of old stations and the building of new ones. It could not, in time of peace, be accomplished overnight. The construction of the Hawthorne depot in 1930 on a 327-square-mile tract was only the beginning of a large reconstruction program which was still under way when national defense construction overtook it in 1940.

Ammunition - depot functions. — Two categories of activities were carried on at these ammunition depots: storage and production. Within the production category came the overhaul activities already referred to and all the other operations involved in loading projectiles, mines, and bombs with explosive, the packaging of smokeless powder, and the assembly of the component parts into unfused ammunition. The Navy's principal reliance was on the depots rather than on private industry for the performance of these final steps in the preparation of its ammunition. Indeed, much of the Navy's need for smokeless power was met by the production of the Navy's own powder factory at Indian Head, Md. Private industry was looked to primarily for the manufacture of shells, bomb cases, and other metal components, and of high explosives.

To support production operations much storage space was necessary for bulk explosives and propellants and for inert components. In addition, extensive facilities were necessary for the storage of assembled ammunition. Taking into account all the types of material to be accommodated, three classes of storage facilities were called for. First, there were facilities for storing the most hazardous materials, as exemplified by bulk high explosive, high explosive loaded in thin containers, such as aircraft bombs, and fuses and detonators. Second, there were storage structures for materials like smokeless powder, loaded but unfused projectiles and small-arms ammunition, which demand care in handling but are much more stable than the materials in the preceding group. Third, there had to be storage space provided for inert materials, such as unloaded shells, cartridge cases, empty powder cans, bag materials, and the like.

At some of the stations the production activities dominated, as at Iona Island. At others, storage was the principal function. All the depots, however, were equipped, in varying degrees, to carry on both functions.

Lake Denmark, at the time of its disaster, was not the only station crowded with ammunition left over from the first World War; all the depots were overloaded with explosive material, and how to take care of it became a vexing problem after the great explosion showed the terrific hazards of congested storage.¹ Except for the mine depot at Yorktown none of the old ammunition depots was to be

considered capable of storing high explosives beyond the quantities immediately required by their processing schedules. Only at the mine depot could expansion of high-explosive storage space take place. Consequently, in 1928, under the same construction program that called for the establishment of Hawthorne, the Yorktown depot was enlarged by the construction of 77 high-explosive magazines. Hawthorne was begun that same year, and in 1930 the new depot in the Nevada desert was commissioned. Its principal features were 84 high-explosive magazines and a mine-filling plant.

The critical condition in connection with high-explosive storage was thereby relieved. But facilities for the storage of smokeless powder, projectiles, and fixed ammunition were still highly unsatisfactory. Most of the 1917-1918 magazine construction had taken place at the Atlantic Coast depots. Removing the high explosives from those stations released adequate space for the storage of the Fleet's reserve ammunition, but the Pacific Coast depots were still in a bad way.

The demand for magazines on the West Coast rose gradually between 1930 and 1940 as the Fleet was built up to treaty strength, shifted to the Pacific Ocean, then, beginning in 1938, increased by an additional 20 per cent. Construction of more than a hundred new magazines of all types at the three western depots met partially the enlarged requirements of this period.

The National Defense Program

The fall of France in the spring of 1940 was the signal for the inauguration of the nation's emergency program of national defense construction. Although the bulk of the Fleet remained in Pacific waters, the East Coast became a subject of concern because of war tension in the Atlantic. The correction of existing inadequacies in the ammunition depots on both coasts became imperative. Indeed, a survey had indicated that there was not enough storage space for high explosives, projectiles, fixed ammunition, and the like to permit the accumulation of an adequate reserve supply of ammunition to meet the needs of the new fleet units then under construction.

One of the most urgent needs was additional magazines for the storage of high-explosive items such as aircraft bombs and mines in the Puget Sound area. The Ostrich Bay depot, severely limited in its capacity for expansion, was already

¹ House Document 199, 70th Cong., p. 5, "Ammunition storage conditions."

cramped for space. A new site was required to accommodate the facilities called for in the vast new program then getting under way, and Indian Island was chosen, a 4-square-mile island in Puget Sound.

On July 11, 1940 a cost-plus-a-fixed-fee contract for the construction of the new depot's facilities was awarded. The plans called for 25 high-explosive magazines, a pier, and a seaplane ramp to permit the servicing of aircraft, as well as the administration, personnel, and service buildings and the roads and utilities needed to support the station's operations. The first structure was usable in late July 1941.

In October the facilities at Hawthorne, where space was practically unlimited, were increased by the construction of 23 high-explosive, 22 smokeless-powder, 7 fixed-ammunition, and 26 projectile magazines. At the same time the station was further improved by the building of 15 miles of railroad within its boundaries.

For many years the Navy had cherished the idea of a great ammunition depot, secure behind the Appalachians, big enough to accommodate vast storage facilities of all types, and capable of producing as much ammunition as all the East Coast depots combined.² Such a station would be indispensable if the depots on the coast should be subjected to bombing raids. It could be viewed as an eastern counterpart of Hawthorne, supporting the coastal depots.

Authority and funds for the new station were made available in June 1940. An 8-square-mile site was finally chosen, near Burns City in southwestern Indiana. In December the construction of the first stage of the new establishment was undertaken. Facilities called for in this initial portion included 23 earth-covered magazines, personnel facilities, 7 miles of railroad, administration and shop buildings, roads and services, a case-ammunition filling house, a bag-charge filling house, and an Explosive-D loading house. Construction got under way in January 1941. The new station was named the Crane Naval Ammunition Depot in honor of Capt. W. M. Crane, first chief of the Bureau of Ordnance.

On July 19, 1940, Congress, responding to the President's call for a Navy large enough to meet any potential combination of hostile forces, authorized the "two-ocean" Navy. Just as the 1938 authorization of an enlarged fleet had invalidated naval-base plans then being carried out, the new

authorization immediately demanded an entirely new calculation of ammunition-depot needs. It was clear that an enlarged fleet would require a corresponding increase in the supporting facilities ashore. The newly authorized depot in Indiana could be considered the keystone of the East Coast ammunition-depot establishment.

The coastal stations were next to receive attention. North of Cape Hatteras the Navy was fairly well equipped to supply ammunition to fleet units operating out of its yards and bases, but to the south there was practically nothing. Ships from the Charleston Navy Yard had to go all the way to St. Juliens Creek, Va., for ammunition. The need for a new depot in the Charleston area was recognized by Congress when, in September, following the authorization of the "two-ocean" Navy, it took up the Navy's need for public works. Funds were appropriated to build a depot capable of arming and supplying ammunition to aircraft and destroyers of the South Atlantic coastal patrol.³

A small ammunition depot had been built in 1917-1918 across the Cooper River from the navy yard, but it had been de-commissioned for several years and most of its buildings had been torn down. The site of the old depot, however, was adjudged inferior to a more accessible area about 5 miles up the river, on the same side as the yard. The contract for the new depot, let in December 1940, called for 21 high-explosive, 10 fixed-ammunition, and 7 fuse and detonator magazines, a pier, and administration facilities. No production facilities were included.

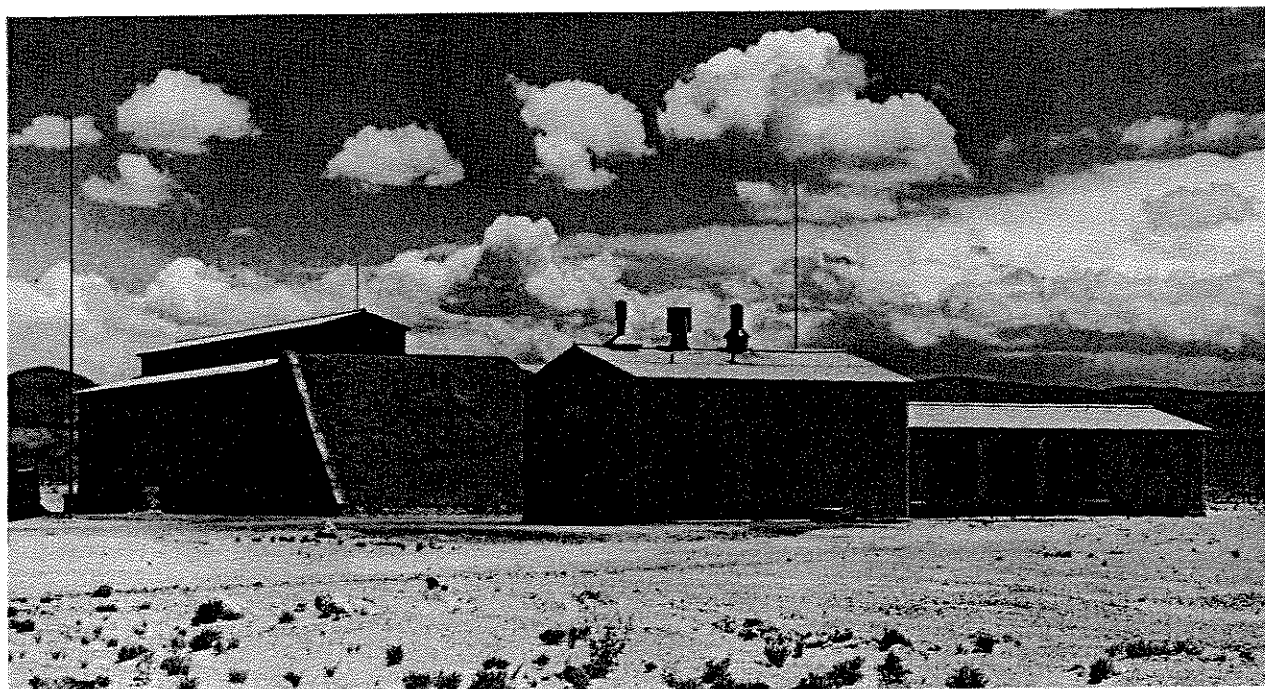
The loading and handling of mines was the next subject to be given attention, for mine defense was an important item in the Navy's program. Only two stations were involved in this problem, Yorktown and Hawthorne. With funds made available by Congress in September 1940, the new facilities were put under way.⁴

At Yorktown the erection of a TNT reclamation plant and a mine-assembly building sufficed. West Coast needs, however, were more extensive. An enlargement of the mine-filling facilities at Hawthorne was required, and, to balance the inland depot's increased capacity, mine-handling accommodations on the coast had to be augmented, for existing facilities there were deemed inadequate to permit handling the mobilization supply of mines at the scheduled rate. In March 1941, a two-unit

² Hearings, First Sup. Nat. Def. App. Act, 1940.

³ Hearings, Second Sup. Nat. Def. App. Act, 1940.

⁴ Second Sup. Nat. Def. App. Act, 1940.



TNT-RECLAIMING BUILDING, HAWTHORNE, NEVADA

Note the barricade built between the reclamation building (left) and its auxiliary buildings.

mine-filling plant, consisting of six, barricaded, concrete buildings, was put under contract at Hawthorne, and a mine-assembly building and a mine-handling wharf were undertaken at Mare Island.

At about the same time as the extension to the mine-handling facilities was put under way, less extensive improvements and additions to the production facilities at several other depots were undertaken, including St. Juliens Creek, Puget Sound, and Iona Island.

Facilities at Yorktown were expanded by the addition of two storage buildings for inert materials and improved by the construction of a new pier and the dredging of the channel leading to the station. Attention was then directed to the conditions on the West Coast.

Naval activities on the southern California coast had expanded prodigiously during the past several years, but there was no ammunition depot in the area to give them the support furnished San Francisco Bay and Puget Sound activities.

The distances separating Hawthorne from San Diego and San Pedro were too great to permit those two great centers of activity to function properly according to mobilization plans. It would

be necessary to have much nearer at hand an adequate supply of bombs for the air stations, ammunition for the Fleet Marine Force, ammunition for local defense forces, and initial fills for merchant ships to be armed on mobilization.

[Authority and funds to build a new station in the area were provided by Congress in early April.⁵ A rugged 14½-square-mile tract of land at Fallbrook, Calif., was selected, 53 miles north of San Diego and 20 miles inland. Construction was undertaken on May 26. A total of 78 magazines was specified, together with 5 storehouses and the necessary complement of service buildings, quarters for resident personnel, and utilities.

When the summer of 1941 arrived the country's manufacturing facilities were deeply committed to producing the tools for national defense. The building of the "two-ocean" Navy authorized a year earlier was well under way, as was the recently authorized 10,000-plane program. The progress being made on these basic programs was the controlling factor in determining the needs of the ammunition-depot establishment; the Naval Appropriation Act for 1942 recognized those needs

⁵ Fifth Sup. Nat. Def. App. Act, 1941.

and provided funds for enlargements and additions at most of the depots.

In June the remaining portion of the facilities that had been planned for Crane were let to contract, comprising 25 more high-explosive magazines, 6 inert-material storehouses, an illuminating and flare-loading plant, a mine- and bomb-filling plant, minor industrial buildings, 14 additional miles of railroad trackage, and additional roads and utilities. Illuminating projectiles, or "star shells," had theretofore been produced only at the Naval Ordnance Plant at Baldwin, N. Y., but cramped quarters precluded the expansion of that station's capacity to the extent necessary to meet the production requirements.

An extensive enlargement of Hawthorne's storage capacity was also provided in the appropriation act, and the construction of 103 more magazines was initiated early in August. The storage capacities of four of the older coastal depots also were somewhat increased at the same time; 11 magazines and an inert storehouse were added at St. Juliens Creek, 4 magazines at Hingham, 14 at Mare Island, and 2 magazines and an inert storehouse at Puget Sound.

The Fort Mifflin depot, although its capacity was not enhanced under the 1941 summer program, was the object of some highly important improvements. Situated on the mud flats between the Delaware and the Schuylkill rivers, the station was poorly protected from flooding at high tide, for the dike that was its reliance was old and defective. Moreover, the station's pier was short, and frequent dredging of the channel leading to it was required. In order to improve this situation, contracts were let in August and September for repairs to the dike, for the filling of low land, and for a pier extension which would allow the direct loading of cruisers or smaller vessels.

Operation of the North Atlantic neutrality patrol had by this time disclosed a serious deficiency in the facilities on the northeast coast for the storage and trans-shipment of ammunition, particularly high-explosives. The depot at Hingham could support the patrol operations without undue difficulty as far as gun ammunition was concerned, but its capacity to store depth charges, bombs, and other high explosives was too small. Funds for the construction of additional storage facilities in that area were made available in July.⁶

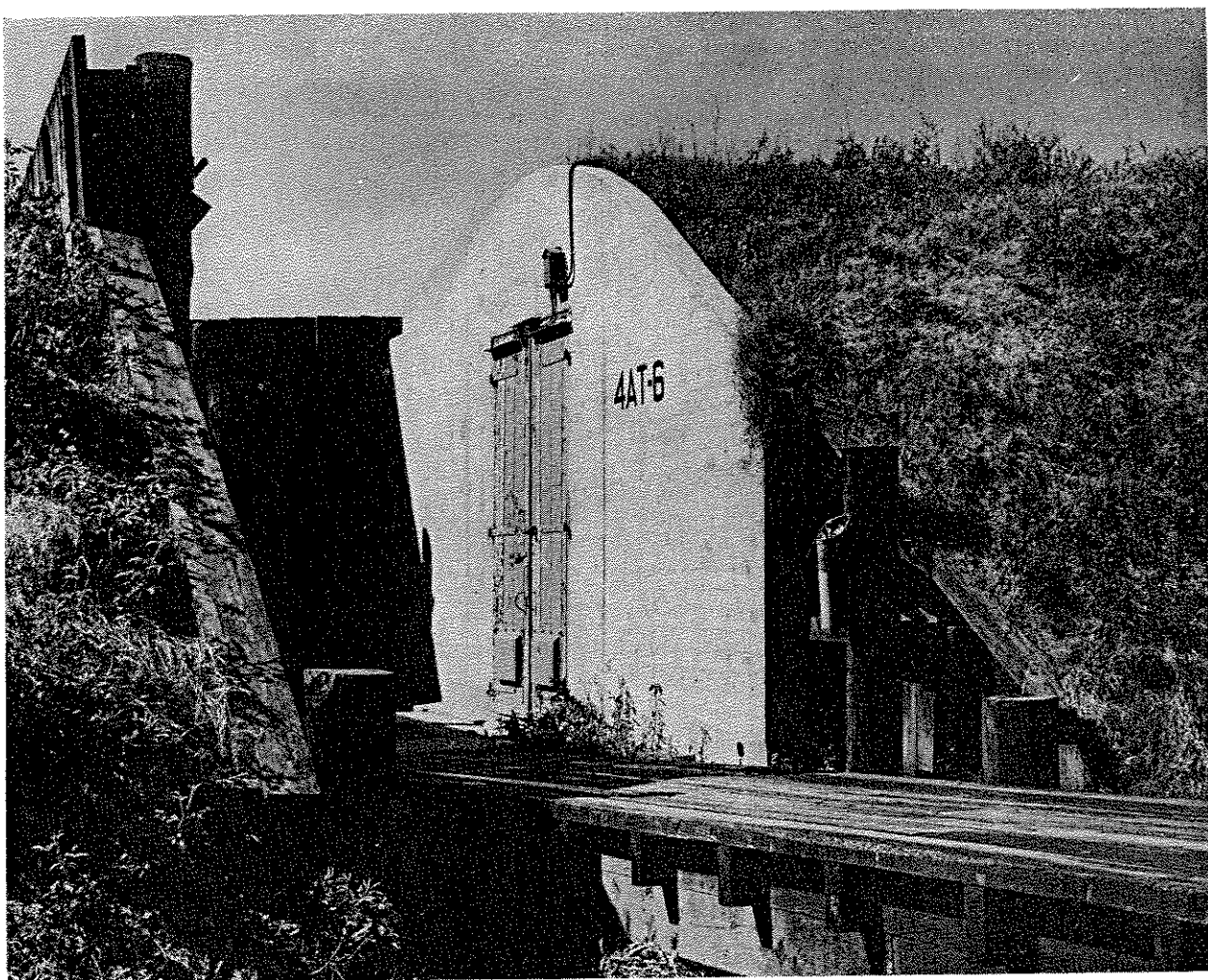
A new tract of land was acquired at Cohasset, 2 miles from Hingham, to accommodate the storage facilities planned, and an area adjacent to the main station was selected as the site for a new pier. In August, construction was begun on the new four-barge-berth wharf at Hingham, 32 high-explosive magazines, and incidental structures at Cohasset, and a railroad to connect the two locations. Access from the new pier to the anchorage in Hingham Bay was improved by dredging the connecting channel.

By the end of the summer the production of ammunition by American industry was approaching full tide and was outrunning the capacity of the Navy's depots to receive and store. New magazines at all the stations were no sooner built than they were loaded to capacity, but still more ammunition was on the way and would have to be cared for. The First Supplemental National Defense Appropriation Act approved on August 25, took this critical situation into account and provided funds for further expansion of the already huge Crane and Hawthorne installations. For the Indiana depot, 197 more magazines were put under construction together with 36 inert storehouses, an ordnance storage building, and extensions to its production facilities.

Hawthorne's storage facilities were augmented by the building of 55 high-explosive magazines, 36 inert storehouses, a torpedo storehouse, 50 projectile and smokeless-powder magazines, plus extensions to the roads and utilities. Indian Island was also expanded by 33 high-explosive magazines, 6 fuse and detonator magazines, and additions to the station's production facilities.

Germany, estranged from the United States, had not yet reached the high-water mark of her conquests, and it was feared that her armies might reach the west coast of Africa and then break out of the Old World entirely in a move upon South America. Under the circumstances, adequate defense of the Caribbean and Gulf of Mexico areas became of critical importance. Moreover, American ship-building had become an inland as well as a coastal industry. The Mississippi was the road most inland-built craft took to reach the sea. Ships built in such places as Manitowoc, Pittsburgh, and St. Louis were brought, without ammunition for their guns, down the river to its mouth. To send them, still defenseless, to such distant points as Charleston or the Canal Zone for arming was a risk too

⁶ Second Def. App. Act, 1941.



HIGH-EXPLOSIVE MAGAZINE, NEW ORLEANS AMMUNITION DEPOT

great to take. These two factors, taken together, argued convincingly for an ammunition depot at New Orleans.

Authorization and funds to build the new station were provided in the act that authorized the expansions at Crane, Hawthorne, and Iona Island, in August. A site on the river a few miles below New Orleans was chosen, and in early December the construction of the first facilities for the new station were let to contract. Those facilities included 13 magazines, a wharf, and the railroad trackage, roads, services, and administration structures necessary to put the depot in operation.

Nearly all the ammunition depots had their facilities expanded in large or small degree, and most of the work was well under way when the Japanese struck Pearl Harbor.

Expansion of the Navy's ammunition-depot facilities had been under way for a year and a half when war became an actuality. Older stations had been expanded, in most instances modestly, to the practical limits of their sites, and new stations had been added. At the beginning the effort had been centered on bringing the shore facilities for handling ammunition into line with the fleet-expansion program; in the later months of 1941 the problem had become one of trying to keep ahead of the flood of shells, bombs, mines, and similar items coming out of war factories.

Construction in 1942

By the beginning of 1942 the Navy was provided with two gigantic inland depots, Hawthorne and Crane, both still undergoing apparently unending



MINE ASSEMBLY BUILDING, HAWTHORNE AMMUNITION DEPOT

Safety regulations allowed buildings protected by earth barricades to be located at half the spaces permitted between unbarricaded structures.

expansion. Two new depots had been established on the West Coast, at Indian Island in the north and at Fallbrook in the south; the East Coast facilities had also been augmented by the two new stations, at Charleston and at Cohasset; on the Gulf Coast a new facility at New Orleans had just been put under construction when the war opened. The period that lay ahead would call for further construction programs of such magnitude that the earlier work, vast as it was, in comparison would seem almost of minor magnitude.

As far back as 1927 the Navy had considered the establishment of an ammunition-shipping facility somewhere in San Francisco Bay. In that year the Bureau of Yards and Docks had recommended to the Board for the Development of Navy Yard Plans, in connection with the proposed construction of the Hawthorne depot, that provision should be made somewhere on the Bay for the intransit storage of high explosive, including appropriate rail facilities and a deep-water pier. When war in the Pacific became a reality the inadequacy of the West Coast shipping facilities for the trans-shipment of large quantities of ammunition was quickly evident; only a small part of the ammunition out

of Hawthorne could be shipped from Mare Island, and commercial ports on the Bay would have to be relied upon, an unduly hazardous situation.

Three days after the Pearl Harbor attack a board of officers of the Twelfth Naval District recommended the construction of the needed shipping facility at Port Chicago, on the south shore of Suisun Bay, on the site of an old disused shipyard. While the immediate need was for a shipping depot for high explosives, the board's recommendations included the eventual transfer of all ammunition activities from Mare Island to the new station. Under the circumstances the Secretary of the Navy, acting under his new authority to approve construction projects to be financed by the \$300,000,000 public-works fund in the Third Supplemental National Defense Appropriation Act, in the middle of January approved the undertaking, and the initial construction contract was let. It involved the dredging of a channel and an approach basin, the rehabilitation of some buildings existing on the site, the construction of a pier and approach trestle, and rail trackage and utilities.

When Port Chicago's facilities were put into operation it became the Navy's only war-scale ammu-

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nition-shipping point on the West Coast so located as to minimize explosion hazard to surrounding property. In the Puget Sound area, commercial piers in Seattle had to be used for the purpose, for neither the Puget Sound nor the Indian Island depot was directly connected with the nation's railroad system. Commercial piers were used also in the San Diego-San Pedro area. On the East Coast there was modest space for loading ammunition ships at St. Juliens Creek, and at most of the other depots lighters could be loaded to carry ammunition to specially designated anchorages for transfer.

The start of the war was the signal for drastic upward revisions in all programs for the procurement of tools and the materials of war. The Navy's construction program felt the resultant impact immediately; hastily, probable shore station needs were estimated, approximate plans for construction were laid out, and contracts were let. For the ammunition depots this new burst of activity was directed mainly toward accomplishing a great increase in storage facilities to keep ahead of the stepped-up ammunition production.

By March 1942, another new storage program was under construction at the western depots. Hawthorne was increased by 147 high-explosive magazines and 4 inert storehouses. A modest enlargement at Indian Island added 6 magazines. Fallbrook, at the south end of the coast, was increased by 22 new magazines and 4 new inert storehouses. Several inert storehouses were started at Mare Island. On the East Coast, facilities at Lake Denmark were augmented by the construction of a new heavy-ordnance storehouse.

In April the eastern ammunition facilities became the subject of expansion. At Crane the new storage facilities put under construction, 601 magazines and 53 storehouses, outstripped in magnitude any ammunition project undertaken theretofore, and more than tripled the huge inland depot's storage capacity. The new magazines and storage buildings required a corresponding extension of the railroad and utilities systems serving the station.

The enlargement of Crane was followed immediately by smaller increases of the eastern coastal depots. Hingham's Cohasset annex was enlarged by the construction of 75 magazines, needed to support the operations of the North Atlantic patrol. Minor enlargements of storage capacities were also begun at St. Juliens Creek and at Fort Mifflin.

In the latter part of May, Hawthorne was again enlarged. More magazines, 230 this time, and 30

more storehouses were made the subject of a new construction contract. Indian Island's storage was increased by nine magazines and four storehouses. The new Gulf Coast depot at New Orleans was next on the list for enlargement, by 35 new magazines and two storehouses.

Expansion of industrial facilities at the ammunition depots during this early 1942 period was of minor magnitude. New shell-loading facilities were undertaken at Fort Mifflin, and a temporary mine assembly plant was put under way at Indian Island.

Even while the depots at Hawthorne and Crane were being expanded so prodigiously in the early summer of 1942 it became apparent that the need for inland production and storage of naval ammunition would still not be met. Enlargements under way would, when completed, tax the capacities of their rail connections, however, and further expansion, it was decided, would have to take place at new points. Plans were laid, therefore, for the building of two additional inland depots, on trans-continental railroads, and the choice of location fell on Hastings, Nebr., and McAlester, Okla. On the first of July, letters of intent were forwarded to contracting firms authorizing them to begin construction.

The two new stations were designed as twins, as nearly identical as the sites permitted; the contract for each depot called for the construction of 707 magazines, 70 storage buildings, 2 large-caliber loading plants, 2 medium-caliber loading plants, and a two-line bomb- and mine-filling plant.

Operation of an ammunition depot requires a large organization. Until the summer of 1942, all depot labor had been civilian, but, under the circumstances that had come about, it became impossible to maintain operations on that basis. The new depots had been deliberately located in thinly populated areas, areas incapable of supplying the war-time labor force for the huge operations necessary. To relieve the condition of inadequate forces, civilian housing projects had been developed near several of the depots, but it was finally decided that civilian labor would have to be supplemented by enlisted personnel, a decision resulting in the formation of Ordnance Battalions.

To accommodate these men the Bureau of Ordnance initiated a \$2,340,000-program of barracks construction at various depots. The first station to benefit from the program was the Yorktown Mine Depot, where the building of four 228-man bar-

racks was begun on July 23. The next day, construction was started on eight 100-man barracks at Hawthorne. Other barracks groups were built that summer at Fallbrook, Mare Island, Lake Denmark, Port Chicago, Hingham, Cohasset, St. Juliens Creek, Indian Island, and New Orleans. The largest of these installations, at Mare Island and at St. Juliens Creek, were for 1,200 men each. The Mare Island project was constructed across the strait, in Vallejo; all the others were built within station boundaries.

Within its first few months the war had demonstrated that huge quantities of anti-aircraft ammunition would be consumed, and to support its fighting units the Navy in mid-1942 went in for a program of producing its own 20-mm. ammunition. On 25 July one of the buildings at St. Juliens Creek was converted to serve as a 20-mm. cartridge filling house. A month later a new building for that purpose was built at Mare Island. Toward the end of the year a similar building was put under construction at Hingham, and two each were begun at Hastings and McAlester.

The great program of magazine construction that had been put under way during early 1942 was by the fall of that year seen to be still inadequate to care for the ammunition produced by American industry. The task of building more magazines seemed endless. In a letter to the Bureau of Ordnance the inspector of ordnance in charge at Hawthorne wrote in September that the magazines available and under construction there would all be full in a year, and his recommendation was for undertaking "all possible magazine construction," as he foresaw an ever-increasing demand for storage space.

In October, another increase in the capacity of the Nevada depot, by 601 more magazines and 45 more inert storehouses, was undertaken, and a roughly equivalent enlargement of Crane, 595 magazines and 55 storehouses, was begun.

Aside from the ammunition loading facilities included the new depots at McAlester and Hastings, and the comparatively modest 20-mm. anti-aircraft ammunition program, the accent during 1942 had been on storage, and more storage. Little expansion of production plant had taken place. However, toward the close of the year the development of a new explosive was the occasion for starting a new program of building new production facilities. The new material was "torpex," a super-explosive to which the Bureau of Ordnance had

been giving increasing attention for some time. Some torpex loading of mines and depth charges had taken place in converted TNT plants, but it had been found that those plants were rather unsuitable for the equipment and pouring rates necessary in handling the new material. Following the recommendation of the Bureau of Ordnance, a loading plant specifically designed for torpex was put under construction at Yorktown in December.

Just before the end of the year, significant additions were also made to the industrial facilities at the two mid-continent depots. At Hastings, two 40-mm.-shell plants, two 20-mm. plants, two medium-caliber case-filling houses were built. At McAlester, similar facilities were provided.

Increased activity at Hingham, involving much water-borne traffic on the Weymouth Back River, had necessitated such frequent openings of the draw bridge carrying a main road over the river that the flow of highway traffic between Boston and other Massachusetts Bay points, including the ammunition depot, was seriously impeded. To remedy the situation, a new fixed bridge with clear height adequate to pass tugs and ammunition barges was constructed to replace the draw span, thereby facilitating access to the depot.

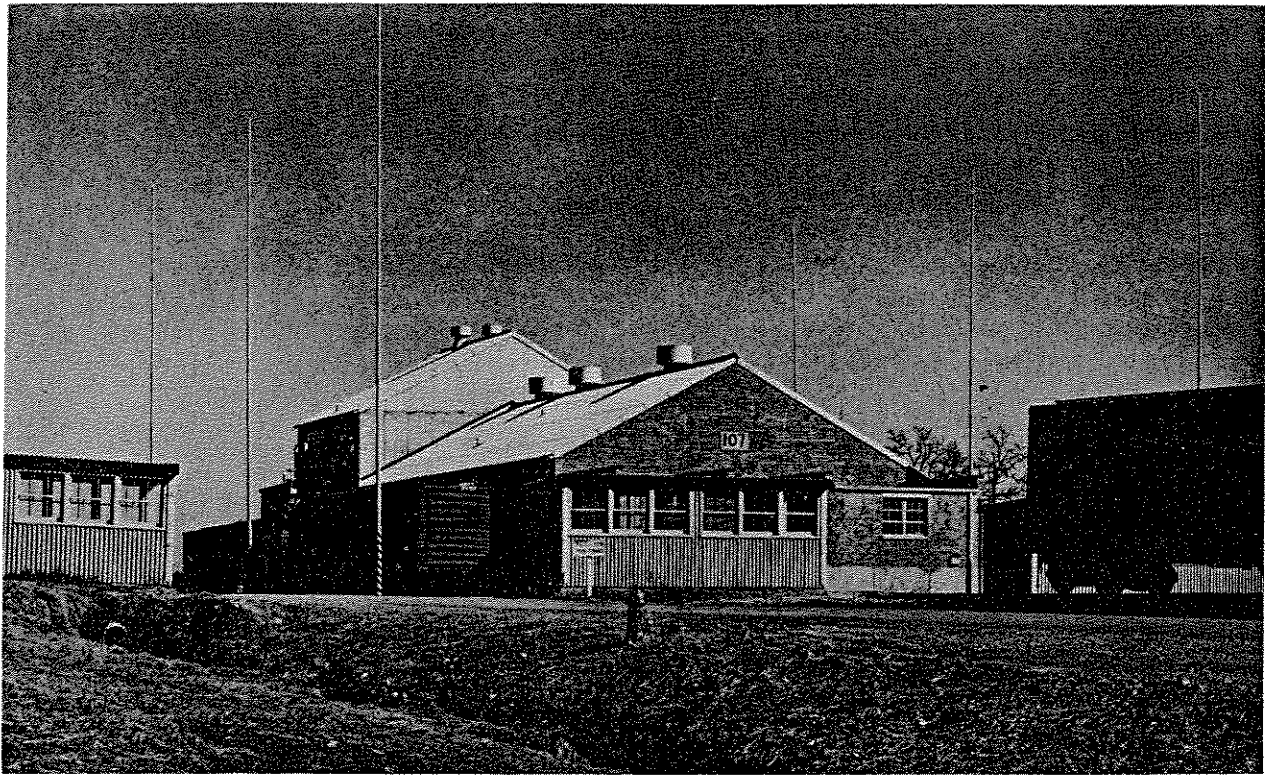
Construction in 1943

Three new ammunition depots had been established during the war's first year—the shipping facility at Port Chicago and the twin inland stations at Hastings and McAlester—and total storage capacity had been expanded prodigiously. During 1943 the inland depots were further strengthened, a new shipping facility was constructed for the East Coast, and new structures were built to provide for the production of new types of ammunition.

The opening months of the new year saw only scattered projects for new construction at the depots, most of them for the purpose of rounding out major facilities. Additional barracks were built at Hastings and McAlester, extensions of utilities and auxiliary facilities were begun at a number of other stations, and minor production improvements were made. Foreshadowing the great construction program to come a year later, modest facilities were put under construction at Crane and at Hawthorne for the assembly of rocket motors. At Crane, also, extensions were made to its 20-mm.- and 40-mm.-cartridge filling capacity.

Of greater magnitude than these varied undertakings was a further expansion of ammunition

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MAJOR-CALIBER BAG-LOADING PLANT, McALESTER, OKLA.

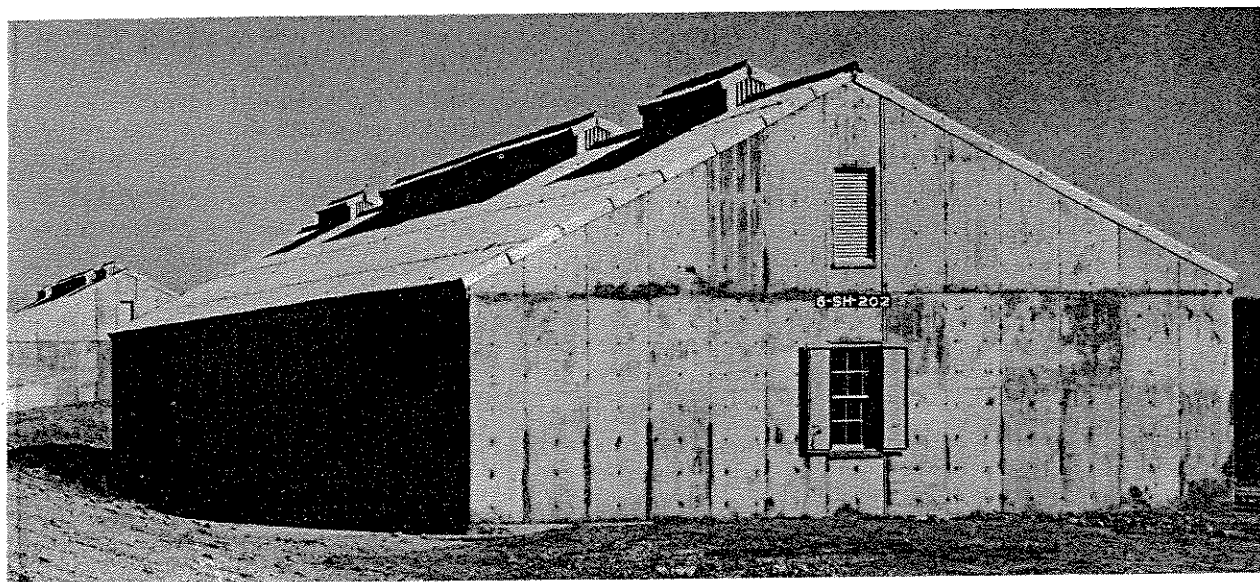
storage facilities. A relatively small addition was first made at Hawthorne, providing 166 more magazines and 12 more storehouses. Much larger expansion was then undertaken at Hastings and McAlester. Authorized facilities at the mid-continent depots were approaching usable completion by the spring of 1943. Since their original authorization the Bureau of Ordnance had had time to re-study the needs at those stations and had recommended some sizeable adjustments. In addition to increasing the accommodations for station personnel, the recommended program included an important expansion of the quota of magazines and storehouses. At both stations the additional structures were put under way in April, including 333 magazines and 30 inert-materials storehouses each. Also, each station was further improved by the construction of ignition filling and quilting houses, bag-sewing buildings, and auxiliary service buildings. So far, all construction at the two stations had remained consistent with the original concept of twin depots; their capacities were still equal.

War always begets an acceleration of technical developments in weapons and ammunition. Ger-

many had been using influence mines sowed by U-boats in American harbor entrances; the United States Navy had developed its own influence mines. Moreover, the Navy had applied these technical principles to depth charges. The new development called for additional production by the shore establishment, and installations to provide for the new items were put under construction in the early summer of 1943.

At Yorktown two projects were put under way, one a plant for assembling the Mark 29 mine; the other a building for testing the assembled mine. Operational testing had previously taken place at the mine-assembly plants, but as production had increased in volume, testing had interfered with production. The new facility avoided this interference and was designed to permit 100 tests daily. At Hawthorne, where mine production had also been carried on before the war, another new mine-assembly plant was begun.

By mid-1943, American participation in the European war was taking shape. Fighting was going on in Africa, and preparations were being made for the Africa-Sicily-Italy hop. It was becoming in-



INERT STORAGE BUILDINGS, McALESTER AMMUNITION DEPOT
These reinforced-concrete buildings served major-caliber loading operations.

creasingly clear, however, that the major action would have to take place somewhere on Europe's Atlantic coast and that the first act would be an amphibious operation. Already it was obvious that naval support of modern amphibious assault consumed tremendous quantities of ammunition.

Ammunition for the Mediterranean action was being loaded by the Navy not only at its ammunition depots but also at commercial piers in congested East Coast ports. To increase the rate of transfer through existing installations to the level necessary to supply an invasion on the scale contemplated for western Europe was a risk too great to take.

As matters stood, St. Juliens Creek was the only East Coast depot having wharf space available for loading ammunition into Liberty ships, and only one berth was available there. In June the Navy estimated it would have to ship 40,000 tons of ammunition monthly from the East Coast, which would require at least two berths. It was possible to add a berth at St. Juliens Creek, but that would have entailed taking all East Coast naval ammunition ships down the Elizabeth River between crowded Norfolk and busy Portsmouth. The preferable alternative, recommended by the Navy, was establishment of a trans-shipment depot, similar to Port Chicago, in the New York area. Such a

depot, to cost \$20,000,000, was included as a memorandum item in the 1944 Naval Appropriation Act, approved June 26, 1943.

For the piers, a location on Sandy Hook Bay was selected, but the nearest practicable area suitable for the necessary magazines was an 8,419-acre wooded swampy tract about 12 miles inland.

An architect-engineer contract was let late in the spring, and by the end of July, plans were ready for bids on two lump-sum construction contracts. The station was named Earle, in honor of Rear Admiral Ralph Earle, Chief of the Bureau of Ordnance during World War I.

On August 2, work was begun on a barge pier and a trestle approach, railroads, barricaded sidings, and a temporary administration building. Later in the month, personnel and service buildings were begun. This first group of contracts was followed in September with the award of a contract for 249 magazines and storehouses and then by one for laying railroad trackage between the pier and the storage area.

Money had not yet been provided for an ammunition ship pier. Such a pier would have to be located at an adequate safety distance from existing shore installations, in this case 2 miles. The Secretary of the Navy on December 21, 1943, approved funds for a two-berth ship pier to be built at the

required safety distance. On February 2, 1944 a lump-sum contract was signed for the pier's construction.

Except for the work at Earle, relatively little new ammunition-depot construction was started during the second half of 1943. This was mainly attributable to a stabilization of construction volume. The lump-sum form of contract had been re-established and with it the time-lag between design and construction. Although tactical changes and the development of new weapons were beginning to make their demands, and plans for necessary new facilities were under way, the plans had to be complete before construction work could start.

A set of four, barricaded, transfer buildings for Yorktown's assembled mines was started in October. In December, construction began on a booster loading building and TNT-reclamation building at Hawthorne. New barracks at Yorktown, Port Chicago, and Mare Island, and small magazine projects at Indian Island and Lake Denmark were also begun during this period of relatively low activity.

Construction in 1944

In 1944 the Allies gained the initiative on all fronts. Since the high tide of Axis aggression in the summer and fall of 1942, defensive strategy had given way to open attack on front after front, and an all-out offensive to break the military power of Germany and Japan clearly lay ahead. Experience gained at the points where the Allies had already waged offensive war dictated the tactics that were to be used.

Experience also dictated the kind and amount of weapons needed, and ammunition-depot construction reflected strategic decisions. In the main, those decisions called for a much greater ability to supply ammunition to ships of the train so that the magazines of fleet units participating in amphibious operations could be well supplied with the preponderance of metal and high explosive needed for softening shore objectives. Although the provisions of storage facilities had at last caught up with ammunition production, as a consequence of the huge construction programs begun during 1943, trans-shipment capacity was not great enough on either coast to permit accomplishment of the logistic task ahead. On the Atlantic side, it would be necessary to expand facilities at Earle so that the establishment could also serve the Army's ammuni-

tion-shipment needs. On the West Coast a new shipping depot would have to be built at Bangor, Wash., in the Puget Sound area, and a third new depot capable of lighter-loading would need to be established at Seal Beach, near San Pedro, Calif.

The Army's interest in Earle as a point for loading its overseas ammunition was based on the fact that the Army's shipments were taking place at points within the Port of New York, where activities of the scale contemplated to support European action would be too hazardous. In proposing that the installation at Earle be enlarged, with Army funds, the Army cited the need for four deep-water berths, a holding yard for 250 cars, and classification and receiving yards. The Secretary of the Navy agreed to the proposal on February 5, 1944. Design, cost estimates, and construction were handled by the Bureau of Yards and Docks. On February 10, 1944 Navy contracts were let for the construction as outlined, including double-tracking the railroad between the main station and the pier area, building an adjacent road, erecting barracks for additional personnel, and other necessary facilities. The four-berth pier was built as a branch to the Navy pier, joining the main structure at a point where deep water began.

East Coast trans-shipment capacity was given another boost with the award on March 15 of a contract for a new deep-water marginal wharf at St. Juliens Creek. This project had been under scrutiny since May 1943, when it had been considered as an alternative for the proposed installation at Earle. Although the Bureau of Ordnance reduced its estimate of the St. Juliens Creek probable monthly trans-shipment load from 40,000 to 25,000 tons, following the approval of Earle, the commandant at St. Juliens Creek stated that the additional pier would be needed to handle even the reduced tonnage. The Secretary of the Navy approved the enlargement on November 19, 1943.

Technical developments in ordnance items during the war's progress had by this time matured to the manufacturing stage, straining existing production facilities and requiring considerable new construction.

One of the most significant of these developments was in the field of rockets. In November of 1943 the Secretary of the Navy had approved plans to proceed with the construction of additional rocket-motor loading facilities, even though full plans and specifications were not yet ready. It was decided

to build two plants each at Hastings and McAlester for the purpose, and one at Cohasset. Contracts for the Cohasset work were let in March, and for the mid-continent plants in April and May.

When the Navy began to load some of its high-explosive projectiles with amatol, another situation was created calling for new construction. Secretarial approval for the conversion of the TNT-loading plants to amatol-loading at five depots was given in July 1943, but higher priorities of other jobs kept the conversions from the construction stage until the spring of 1944. In March the first conversion work was started at Hawthorne. It was followed by conversions at McAlester, Crane, Hastings, and Yorktown. In general the conversions consisted of the construction of nitrate-preparation and storage buildings, powdered-metal storehouses, and additions to the existing TNT plants.

Explosive "D," in bulk, before it can be loaded must be screened or sifted to rid it of foreign matter. The extent of this operation at many of the depots necessitated the erection of special buildings for the purpose. The first buildings for sifting high-explosive "D" were begun at McAlester in February. They were followed by others at St. Juliens Creek, Crane, Mare Island, Iona Island, and Hingham.

When Fallbrook was established in the San Diego-San Pedro area a great gap in West Coast ammunition-storage facilities was filled. No longer was it necessary for cars of ammunition to be brought all the way from Hawthorne to supply ships loading at the southern California ports. However, as the tempo of the war rose and shipments out of San Diego and San Pedro mounted, the hazard to nearby naval and commercial installations became excessive. What was needed was a waterside facility that could at least load ships by means of lighters.

Congressional authorization for the project was obtained in January,⁷ and Seal Beach, a few miles down the coast from San Pedro, was selected as the site of the new establishment. On April 22, the first construction contract, for relocation of the coastal highway and railroad, was let. There quickly followed contracts for dredging a new entrance channel and deepening and widening the existing basin of Anaheim Bay, the construction of jetties, revetments, and dikes, 80 magazines and 13 storehouses,

an ammunition wharf, and the necessary utilities and supporting structures.

The act of Congress which established Seal Beach also authorized "ammunition storage and trans-shipment facilities for the Puget Sound area."

The new establishment was to relieve the hazards to commercial and industrial establishments in the Puget Sound region as Port Chicago and Earle did in their respective areas.⁸ A railroad was built to a point on the Hood Canal near Bangor, where a two-berth pier, 38 magazines, 9 storehouses, barricaded sidings, sorting buildings, administration and personnel facilities, and utilities were built. The railroad also served Puget Sound ammunition depot and navy yard, two stations which had not previously been connected with the continent's railroad system. Construction began May 10. In September, a project which included general buildings and an ammunition-overhaul building was added to round out the station's first stage of development.

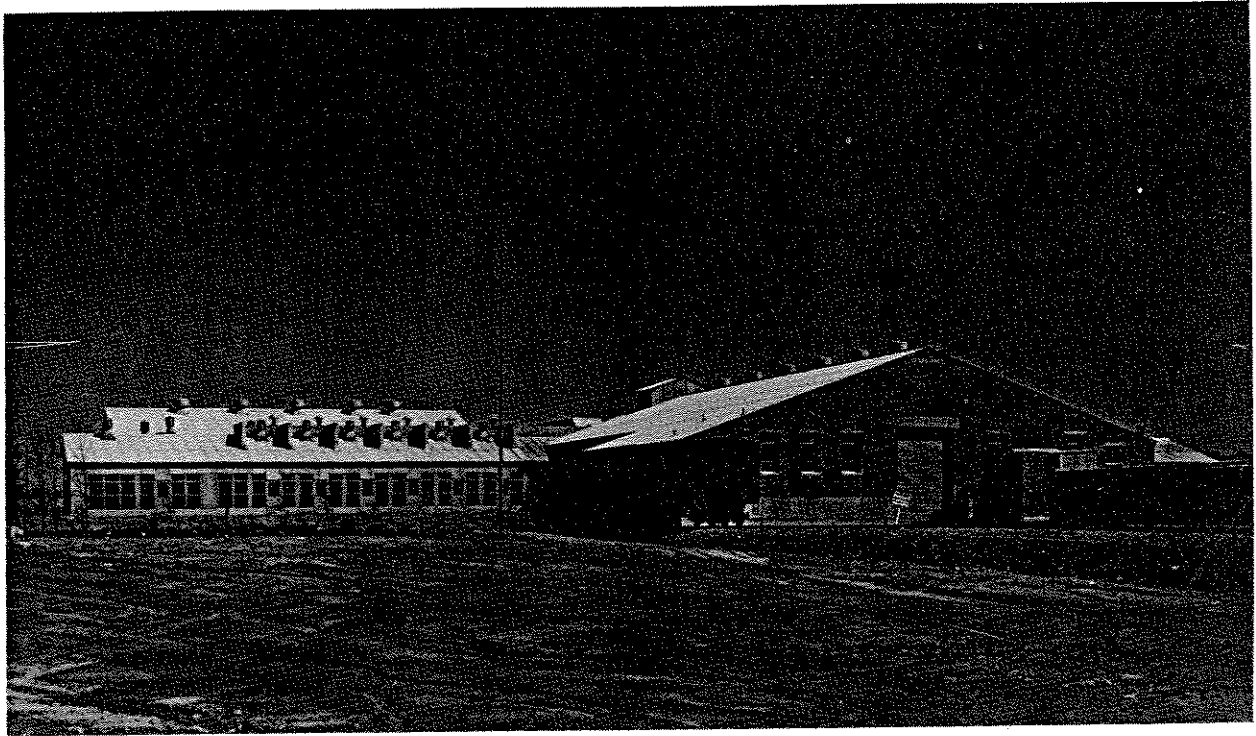
Plans for the development of shipping facilities at Port Chicago called for wharfage space for six Liberty-ship berths. Two berths had already been provided by the pier that had been constructed early in 1942. The second stage of the station's development was put under way in February of 1944, when construction was started on an additional two-berth pier, together with approach trestles and a utility building. The construction work was doomed to disaster, however, for in July a commercial ammunition ship berthed at the first pier blew up, destroying all wharfage, existing or under construction.

A new contract was quickly negotiated, calling for the station's rehabilitation. The older pier was abandoned; the partly built pier was reconstructed and completed; and a third pier, also to provide two berths, was begun, supported by approach trestles, loading platforms, auxiliary buildings, and utilities. Later the function of the destroyed pier was replaced by another pier in a new location.

To expand the berthing capacity of Port Chicago to the extent planned demanded a corresponding increase in the yard trackage, which in a station of that character meant multiplying by several times the mileage of barricaded siding and the number of magazines at the station's disposal. The necessary extension of the barricaded sidings and the addition of magazines, however, was not prac-

⁷ Public 224, 78th Congress, Passed 28 July 1944.

⁸ Senator Walsh's report, No. 621, 78th Congress.



ROCKET MOTOR LOADING ASSEMBLY BUILDINGS, McALESTER

Cells of the wing where actual loading took place (left) were provided with individual outside doors for quick escape of personnel in case of mishap.

licable in the waterside area where the initial facilities had been built, for that side was restricted and foundation conditions were unsatisfactory. To meet this situation, it was decided that the new depot facilities should be constructed on a new inland site. A 5,000-acre tract, $2\frac{1}{2}$ miles inland from the ammunition wharves, was acquired, and in August work was begun on the new structures. In addition to the new barricaded sidings, 168 magazines, 10 inert storehouses, and a number of auxiliary buildings were put under construction. Three highway overpasses and one railroad overpass had to be built to facilitate the operation of the new establishment.

Ammunition-storage facilities were augmented slightly in late 1944. A 39-magazine Fallbrook project, which had been recommended by the commandant of the depot a year and a half earlier, was begun in September. The need for the enlargement could be traced to slow delivery (10 to 21 days) from Hawthorne, which had forced Fallbrook to keep a greater supply of ready ammunition than had been planned. In March 1944 the

Bureau of Ordnance passed the station commandant's request to the Bureau of Yards and Docks.

By the end of 1944, rocket-motor loading was proceeding in a modest manner at the four inland depots and at Cohasset. In December, work began on a large-caliber motor-loading plant at Hawthorne, one of the two depots where experimental loading had been carried on at the beginning of the rocket program.

Construction in 1945

As 1945 opened, American materials of war were being rushed to the Pacific fronts in an ever-increasing torrent. Feverishly the Bureau of Yards and Docks was building the shore facilities necessary to accommodate the flow. Work was well under way on the new ammunition trans-shipment depots at Bangor and Seal Beach, and Port Chicago was being expanded far beyond its original plans. New ammunition-depot projects in 1945 did not bulk large in comparison to that of earlier war years, but they were well pointed toward the uppermost objective—moving ammunition to the Pacific.



GUN-AMMUNITION AREA, SEAL BEACH, CALIF.

Each of the four great inland depots was provided with more storage capacity. On the West Coast, shipping piers under construction at Port Chicago and Bangor were provided with additional magazines, barricaded sidings, and other supporting facilities. On the production side, the rocket-facilities program, initiated primarily in 1944, was making good progress at most stations and little new work was necessary. In some of the new buildings, finished rockets were turned out before the painters and plumbers had left.

In March, work was begun at Bangor on site-clearing preparatory to undertaking that station's second stage of development. This was followed in May by a main construction contract which called for 68 magazines, including 54 gun-ammunition magazines.

Further development of Port Chicago's new inland storage area was begun in July. Additional barricaded sidings were constructed, sufficient to provide for the 550 ammunition cars needed to bring shore storage facilities into suitable balance with the six Liberty-ship berths at waterside. Part of the land for the expansion was already Navy-owned, and the remainder was a 604-acre tract taken by condemnation.

New storage construction at the inland depots began at Hawthorne in March. Work there included

105 magazines and 40 storehouses. In the same month, work was started at Hastings on 126 magazines and 54 storehouses. Next, in May, 127 magazines and 52 storehouses were begun at McAlester, and at Crane two contracts were let to provide 86 magazines and 40 storehouses.

Two small projects initiated in May at eastern coastal depots completed the picture. Twenty earth-covered gun-ammunition magazines and two inert storehouses were included in a Charleston contract. Seven earth-covered gun-ammunition magazines were started at Cohasset.

Most construction initiated during 1945 was still underway when Japan surrendered in August. The only large project to be stopped immediately was Port Chicago's barricaded-sidings job. The flow of new ammunition was halted practically at the moment hostilities ceased, so there was no longer any need for a high rate of car-ship transfers.

Construction Problems at the New Depots

Huge projects featured by large numbers of standard structures typified the program of constructing new ammunition depots, and enlarging the older ones too, for that matter. Magazines of several different types, depending upon the character of the material to be stored, storehouses, barricaded sidings, barracks, and relatively simple

production buildings made up much of the construction task. Several unusual structures, such as the 2-mile-long pier at Earle, of course, departed from the standard pattern, but in large measure such variety as the program as a whole could show derived principally from differences in location and site conditions.

As in all the Navy's war construction program, temporary facilities were built wherever feasible, except where the station and the facility in question were specifically designated as part of the permanent naval establishment. Magazines, of course, were necessarily built of masonry, irrespective of the duration of their probable usefulness. High-explosive magazines for bulk explosives and high explosive loaded in thin containers, fuses and detonators, were reinforced-concrete earth-covered arch structures, 25 feet wide and 20, 50, or 80 feet long. For less hazardous but still highly inflammable materials, like smokeless powder, fixed and semi-fixed ammunition, small arms ammunition and loaded projectiles, magazines were of two general types: above-ground and earth-covered. Magazines of the above-ground type, illustrating earlier practice, were built with masonry walls, either of reinforced concrete or brick, with light steel roof trusses supporting a pitched roof of corrugated cement-asbestos. The light roofs were designed to be blown off in the event of an explosion. The earth-covered magazines were built either as three-span multiple arches or as vertical-walled, flat-roofed reinforced-concrete structures. A large number of experimental triple-beehive magazines was built at McAlester, but not repeated elsewhere. Irrespective of structural type, these magazines provided about 5,000 square feet of useful storage space.

Storehouses for inert materials and buildings to house industrial operations were of masonry when permanent construction was called for; otherwise, of timber frame and composition-board siding. All building design was dictated by the function to be served.

Lightning protection was an important feature of construction at all stations. All metal, including concrete reinforcing, had to be thoroughly grounded in buildings where explosive or inflammable materials were to be stored or handled. Buildings not earth-covered were provided with a primary lightning protection system composed of a number of grounded steel masts interconnected under

ground by a heavy wire girdle. The line of masts, typically, surrounded the structure to be protected, a few feet outside the building lines, providing an "umbrella of protection."

The Inland Depots

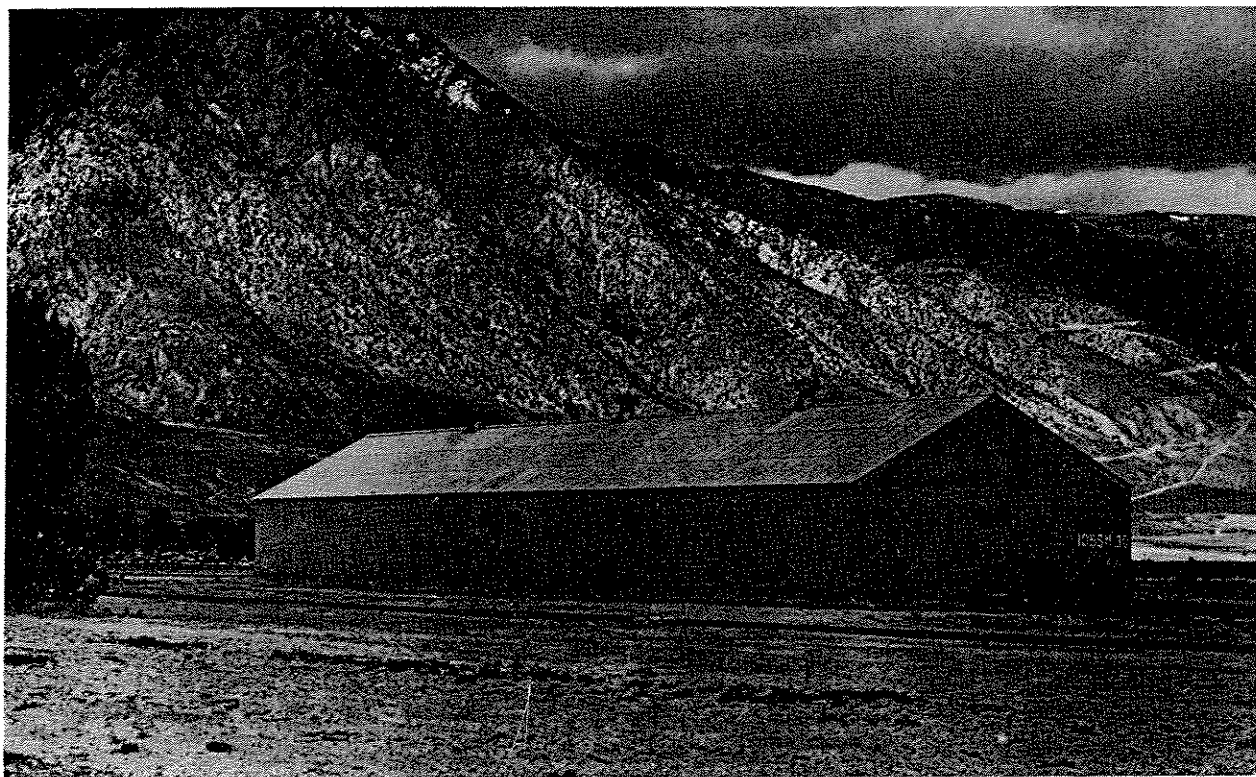
Three great inland ammunition depots were built and the existing Hawthorne depot was vastly expanded during the national defense and war programs. Their primary function was to meet the ammunition needs of large regions of the country rather than to serve local or special functional requirements.

Hawthorne.—Hawthorne, first of the large inland depots, was ideally situated for practically limitless ammunition storage. The useful area, 140 square miles of gently sloping plain, was hemmed in by mountains to the west, rugged hills on the south and east, and salty Walker Lake to the north. At the end of wartime expansion, magazines, storehouses, production and other buildings covered 80 square miles. Almost all of Hawthorne's wartime buildings were erected as permanent structures.

Laid out in accordance with the new safety principles learned from the Lake Denmark disaster, more than 1,100 arch-type high-explosive magazines, 80 small fuse and detonator magazines have been built since 1930. Almost 400 concrete-roof earth-covered inflammable-materials magazines were constructed to store powder, projectiles, small-arms ammunition, and pyrotechnics. In all, 222 inert storehouses were built. Because of the great number of structures to be built according to a standard design, production-line methods were applied in construction, through the use of small gangs specializing in individual steps of erection.

Production structures built at the depot included mine filling and assembly facilities, a case-ammunition plant, a booster loading building, rocket-motor loading, and ammunition-overhaul facilities. As the buildings spread out over thousands of acres, it was necessary to increase the facilities serving them. The following approximate quantities of various utilities and services were installed: roads, 535 miles; railroads, 150 miles; fence, 57 miles; telephone lines, 42 miles; fire-alarm system, 30 miles; water lines, 55 miles.

Before the water lines were needed for fire protection they were needed for construction, and supplying them was one of the earliest problems. Accordingly a considerable part of the first defense-



INERT STORAGE AREA, HAWTHORNE

period contract was devoted to tripling the station's water-supply capacity, both from the surrounding hills and from underground sources. The contractor laid new supply lines from two existing dams to the station, drilled five deep wells, and built three elevated tanks. This involved 18 miles of pipe in addition to the 55-mile distribution network.

For electric power, it was necessary to build a 54-mile 3-wire high-tension transmission line from a substation of the power company, over the mountain range west of the depot.

Isolation of Hawthorne's location introduced numerous obstacles to easy expansion. Efficient construction labor was scarce, and material deliveries were uncertain. The one branch-line railroad serving the station was overtaxed by the freighting of both construction and ammunition materials. Moreover, long-distance truck-hauling was handicapped by the conditions of mountain driving. As practically no accommodations for construction laborers were available in the territory except the limited facilities of an old CCC camp, seven 100-man barracks had to be built to augment those

facilities. A housing program for civilian station personnel was undertaken which ultimately provided 1,225 units, including 300 trailers. This was in addition to provisions which had to be made for naval personnel, of which the largest item was a group of thirteen buildings.

Many of the rails and ties for the station's trackage came from the abandoned Southern Pacific's Promontory line in Utah. This was the original connecting link between the Central Pacific and the Union Pacific railroad lines, where the golden spike was driven in 1869.

Crane.—Crane Naval Ammunition Depot was established in 1940 to serve the East Coast as Hawthorne was to serve the West. Criteria for the selection of its site were similar to those for the pioneer inland depot, and wartime construction made the two stations practically equivalent in capacity.

In several ways Crane had a more advantageous location than Hawthorne, and at the same time it also possessed many of the Nevada station's more desirable features. Crane's 98 square miles permitted the expansion required by the program;

more than half of the area was already owned by the government, and the remainder, being generally non-arable, was acquired at a small cost per acre. As at Hawthorne, Crane development removed little land from agricultural service. Hawthorne's superior isolation and natural security was compensated for at Crane by a greater availability of the basic needs of construction and ammunition-depot-operation labor, transportation, power, and water. Materials and equipment were easily obtained.

The site, in a rugged, easily eroded district of southwestern Indiana, varied in elevation from 510 to 860 feet above sea level. Sharp ridges, separating alluvial bottomlands, provided natural barricades around which magazines groups could be built. Lake Greenwood, an impounding reservoir developed prior to Navy acquisition, covered 800 acres in the northern part of the station and became the main source of water supply.

Among the more significant items of construction at Crane were 1,054 arch-type magazines, 510 inflammable-materials magazines, 167 inert storehouses, 5 torpedo storehouses, 138 miles of railroad, 226 miles of roads, 65 miles of water line, and production facilities for small-projectile and flare loading, mine and bomb filling, case preparation, rocket-motor assembly, and 20- and 40-mm. ammunition manufacture.

Three ordnance storehouses were constructed, provided with humidity and temperature control. The Bureau of Ordnance had noted that the greatest cause of damage to stored precision instruments was corrosion caused by condensed moisture on precision surfaces. Measures to assure constant temperature and humidity to eliminate this cause of corrosion were considered preferable to immersing the parts in grease preparations.

Late in the program of station development an extensive program of culvert headwall enlargements had to be undertaken. In all, 3,864 culverts and other drainage structures were improved. The program was necessitated by the extreme conditions of runoff that had been experienced throughout the highly erodible site. Flash floods had caused many washouts, and the repair of drainage structures caused unduly large maintenance costs.

Rock outcroppings occurred in profusion throughout the station's area; one outcropping near the eastern boundary was used as the main source of crushed rock for concrete roads and rail-

road ballast. It yielded more than 2,000,000 tons of material.

There was no indication of ground water within economically accessible depths, so Lake Greenwood had to be depended upon for construction water. When the project started, the reservoir had been drained for repairs, so all water used during the first few months had to be brought in by tank-car and truck.

As at Hawthorne, standard structures were built by production-line methods. In winter construction of arch-type magazines much time was gained by the use of canvas shelters during operations on each new unit.

High morale of construction labor was a notable feature at Crane. It was expressed in an unusual manner on a Sunday early in 1942, when 98 per cent of all construction personnel, field and office, as well as subcontractors and material suppliers, reported for work and donated the day's pay to the Treasury of the United States to be used in the construction of a projected microfilm storehouse, funds for which had not yet been allotted.

Hastings and McAlester.—Astride the nation's north-south centerline lie Hastings and McAlester naval ammunition depots, the stations which almost doubled inland ammunition loading and storage facilities. Initiated, authorized, and established at the same time, to provide similar services, their sites appeared superficially to present similar construction problems. Actually, their construction histories are contrasting stories of ease and difficulty. Difficult ground conditions, bad weather, poor labor, and slow material deliveries retarded work at McAlester so as to throw it three months behind schedule. In contrast, an almost total absence of these drawbacks enabled the Hastings contractors to meet better deadlines. Perhaps these experiences can be related to the relative costs of the lands acquired. The government paid about \$15 an acre for the 70-square mile tract in Oklahoma, while in Nebraska it paid about \$57 an acre for 75 square miles.

In what was formerly a farming and grazing area, the Oklahoma depot was established 5 miles southwest of the town of McAlester. Two railroads served the site, one touching the northern boundary and the other running along the southeast side. Highway connections were good. The terrain was rolling, with low ridges varying in elevation from 700 to 800 feet above sea level; shale and lime-

stone outcropped on the ridges. The lower areas, where most of the structures were located, were of poorly drained clay overlaid by an unstable sandy loam. When the Navy went in, about twenty per cent of the area had been farmed. The remainder was prairie, used for pasture. Scrub tree growth was a general feature, all merchantable timber having been cut.

Work began on the McAlester construction in July 1942. Unstable and wet ground conditions were the principal retardant. Wet or dry, the overburden would not support heavy equipment, so the first step in site preparation had to be the removal of the surface material with draglines. When it rained the impervious material beneath became unmanageable. Artificial draining partly relieved the condition in the worst places, but again draglines were the ultimate answer.

As on many projects, abnormal weather caused costly delay. A four-day storm, beginning May 7, 1943, piled up 13 inches of rainfall. The resulting floods not only washed out construction operations at the depot, but interrupted rail service for weeks, stopping material deliveries. Thirty days of delay were definitely assignable to that one cause.

The quality of common labor available was poor, and shortages existed during the early months in most of the skilled trades. There were not enough bricklayers available to permit exploiting the one locally plentiful building material. Hence, many buildings for which brick could properly have been used had to be built of concrete. At the job's peak, 15,000 workmen were employed, coming as far as 300 miles. To accommodate them, a 1,200-man barracks group, a trailer camp, and a cafeteria were provided.

Ground water was not available on the site, so six small impounding reservoirs were built to dam the flow of some small streams. Initial construction water needs were met by importation of water in tank cars.

Construction of the connecting railroad between the existing rail lines at the north and southeast boundaries of the station was the first job to be done. The inadequate existing roads were then extended by a 50-mile network of temporary roads. These facilities were ultimately expanded into permanent networks of 121 miles of railroad and 230 miles of highway.

Excavation for the roads, railroads, and buildings accounted for 20,000,000 cubic yards of earthwork,

much of which had to be moved without the help of the more economical types of machinery. The overburden, generally 30 inches thick, had to be stripped to expose usable foundation material, and this overburden, once moved, could not be used for fill.

The station water supply was developed by the construction on Peaceable Creek, in the northern part of the station, of a dam which created a 600-acre reservoir. A water-treatment plant was built, capable of serving a population of 6,000. The sewage-treatment plant was designed for a population of 3,600, but was capable of being overloaded to an equivalent of 6,000. Effluent was discharged into Peaceable Creek below the water-supply dam.

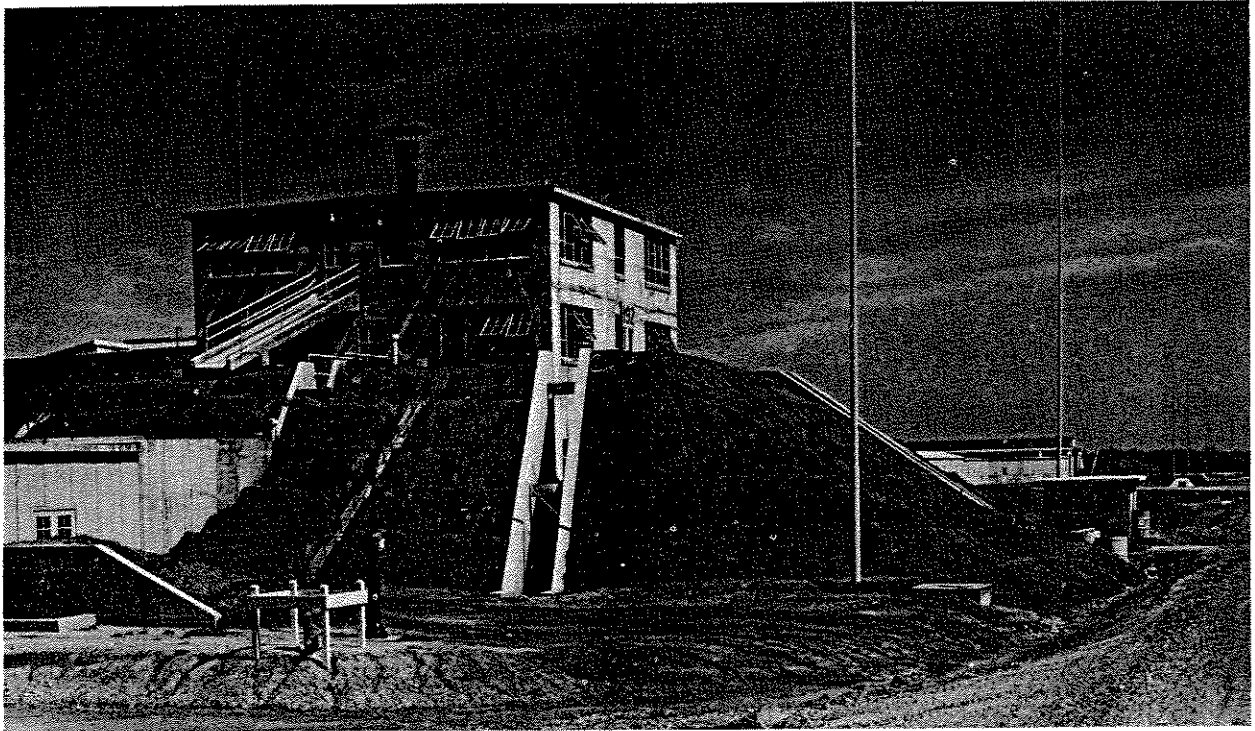
The similarity of the McAlester and Hastings sites existed only in terms of general appearance. Both were devoid of heavy growth. Otherwise, the site characteristics were quite different.

Elevations at Hastings varied from 1,800 to 1,970 feet, with a variation of 5 to 10 feet from hilltop to bottom of draw. Soil was a loess deposit of silt and sandy or silty loam. There was no rock in the area, and the water table lay 70 feet below the surface.

About 2 miles east of the city of Hastings, the land was well suited to economical construction and was strategically situated with respect to transportation, having access to three major railroads, two of them transcontinental, and a major concrete highway. The 76-square-mile tract was in the shape of a triangle, bounded on the north by U. S. Highway No. 6 and on the southwest by the Union Pacific Railroad.

Construction labor was drawn from as far away as 500 miles, and to provide housing a 1,200-man construction camp was built. In addition, 1,560 housing units for operating personnel were built in and around Hastings by various governmental agencies.

Field work at Hastings was begun on July 31, 1942. With the network of section-line roads available at the outset, provision of additional construction-access roads was a comparatively minor item; railroads were built as near as possible to their final location. Scrapers prepared building sites. Trenches for foundations and utilities were dug primarily by traction ditchers and backhoes. The underlying loess was an excellent foundation and compacted well when used as fill. Because of its uniform depth below the surface it could be



BOMB AND MINE LOADING PLANT, McALESTER

Stop boards were set at intervals on barricades and magazines to prevent erosion of earth fill.

reached for borrow purpose at any place within the construction area. Even in winter the loess was easily made available by using rooters to break up the frozen overburden.

As at other large ammunition depots, great numbers of typical structures lent themselves well to production-line methods of construction. Prefabrication of forms, wood trusses, structural and reinforcing steel, and sheet-metal work took place in central shops. Specialist gangs were organized to perform successive operations, such as erecting winter protection, placing foundation forms, pouring foundations, placing superstructure forms, and the like. Three heated-concrete batching plants served transit-mix trucks. The effectiveness of the program is illustrated by the fact that in each of the peak building months the schedule of 70,000 cubic yards of concrete to be poured per month was equalled or exceeded. In the high-explosive area, six to eight magazines were completed daily.

More than 1,500 structures, including magazines, storehouses, production and industrial buildings, were constructed at Hastings, and 227 miles of highways and 115 miles of railroads were built.

McAlester statistics were similar. The 13,000,000 cubic yards of earthwork, though a vast amount, did not approach McAlester's 20,000,000 cubic yards.

The Shipping Depots

As ammunition needs in far-distant forward areas rose during the war to mountainous proportions the Navy was faced with a problem that was essentially new to it. The ordinary coastal depot was designed primarily to serve the ammunition needs of nearby naval establishments and was quite unable to handle an export-shipment problem of such magnitude. Existing commercial shipping facilities were pressed into service, but the hazards presented to commercial ports by the operation of loading ammunition ships called for a different solution. The answer was found in the construction of four new naval establishments specializing in the overseas shipment of ammunition, located at relatively isolated points, one on the East Coast and three on the West.

Port Chicago.—The first such station to be added to the Navy's shore establishment was the Port Chi-

cago Naval Magazine. For some time before Pearl Harbor the Twelfth Naval District had been considering sites for a waterside station which would relieve the pressure on Mare Island Naval Ammunition Depot and remove the hazards of ammunition trans-shipment from urban areas in and around San Francisco. On December 10, 1941, a board of district officers recommended to the Navy Department the construction of a naval magazine at Port Chicago, to be operated by the Mare Island depot. While the only immediate need was a shipping depot for high explosives, eventual transfer of all ammunition activities from Mare Island to Port Chicago was contemplated by the report.

The site chosen was on the south shore of Suisun Bay, 10 miles farther from the sea than Mare Island. Its 640 mainland acres were mostly salt marsh lying between the northern end of the Mt. Diablo Range and tidewater. An 8-foot tide, plus the flow of the Sacramento and the San Joaquin rivers, kept the channel alongside clear for deep-draft vessels.

Early development at Port Chicago included a pier, inert storehouses, a personnel area, and an extensive system of barricaded sidings, some of the barricades containing high-explosive magazines. Buildings outside the high-explosive area were of temporary construction.

As filling operations progressed, the pier and roads and railroads were built and the old roads, railroads, and utilities were rehabilitated. Barricades and magazines were supported by wood piles, but the temporary structures were built on spread footings. Subsidence of spread footings on new fill, however, was so bad in the inert-storage area that it was necessary to abandon construction of one storehouse. As much as three feet of subsidence occurred in some of those which were built, entailing considerable extra work. Although part of the subsidence could have been attributed to the settlement of new fill, much of it was caused by displacement of the unstable material beneath. This was borne out by the fact that the level of unfilled areas adjacent to reclaimed ground rose as borrow was deposited.

Port Chicago's combination magazines and railroad-siding barricades were unique in ammunition-depot construction. Five explosive magazines, 17 feet by 25 feet in plan, were built into the fill of each of ten barricades. Headwalls, doors, and small platforms were made part of the retaining

walls facing the siding tracks. Magazine earthfills appear as blisters in the normally straight embankment outside the retaining walls.

In mid-1944, when it was decided to provide a total of six ship-loading berths and to open up the new inland area, Port Chicago's tidewater area had been developed about to its limit, as far as shore construction was concerned.

Forty barricaded sidings provided more than 250 protected ammunition car settings, plus the small storage spaces previously mentioned. Other storage space was for inert materials, nine 50-by-200-foot buildings having been provided for that purpose. Fifteen temporary barracks with their associated facilities, administration and shop buildings completed the development.

When the explosion occurred in July 1944 a barge pier and the original two-berth wharf No. 1 were in operation. Under construction was the second two-berth marginal wharf and the Navy was acquiring more land farther east along the shore for another marginal wharf. The explosion ruined Pier No. 1 and the construction under way on Pier No. 2, but it did not alter the Navy's intention to provide three two-berth piers. Pier No. 2 was completed, No. 3 was built as planned, and No. 4 was built at a new location, east of 2 and 3, to replace the function of No. 1.

There was not room in the tidewater area for the shore facilities necessary to back up a second and third pier, so an inland tract was acquired.

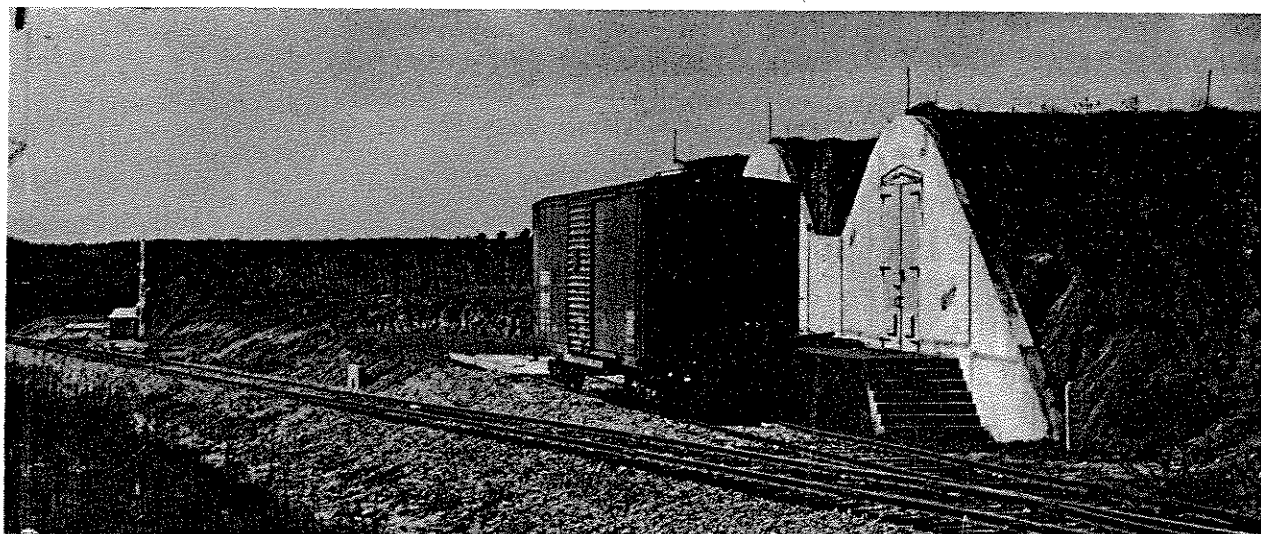
About half the terrain of the inland area was flat lowland and half, foothill. An existing railroad connecting the town of Port Chicago with a cement plant back in the hills, ran along at the toe of the slope. It was improved and adapted to station use, serving as the backbone route of the transportation system.

As developed at the time of victory over Japan, the area included 75 high-explosive magazines, located in the hills, a group of 93 gun-ammunition magazines on the flat land, and 30 barricaded sidings built along the dividing railroad. Under construction were additional barricaded sidings to accommodate 550 ammunition cars, a project that was curtailed to accommodate 55 cars shortly after V-J day. As Port Chicago had been designated a permanent unit of the shore establishment, all building construction at the inland area was permanent.

At the waterfront site the principal deterrent to

speedy construction was the unstable and marshy nature of the ground. Mostly inundated at high tide, the area was formed by a deposit of silt and decayed marsh vegetation extending in some places to a depth of 75 feet. This area had been subsiding gradually for ages, building up layer upon layer

became a Navy "must." Site criteria required that the area selected have adequate commercial rail connections, and be within reasonable distance of the Port of New York and yet where there would be no danger to bridges, tunnels, industrial activities, or the ship channels serving New York. This



TRIPLE-ARCH GUN-AMMUNITION MAGAZINES, McALESTER
Construction of rail sidings to the magazines was simplified by locating the buildings at an oblique to the main track.

of marsh grass to catch silt at each high tide. As the material which might have been pumped in from the Bay was of the same nature, it was necessary to reclaim the land with earth borrowed from the nearby hills. Ultimately, 1,235,000 cubic yards were used for that purpose.

The inland area, on the other hand, was well adapted to heavy construction. Foundation conditions were good, and earthwork was not difficult.

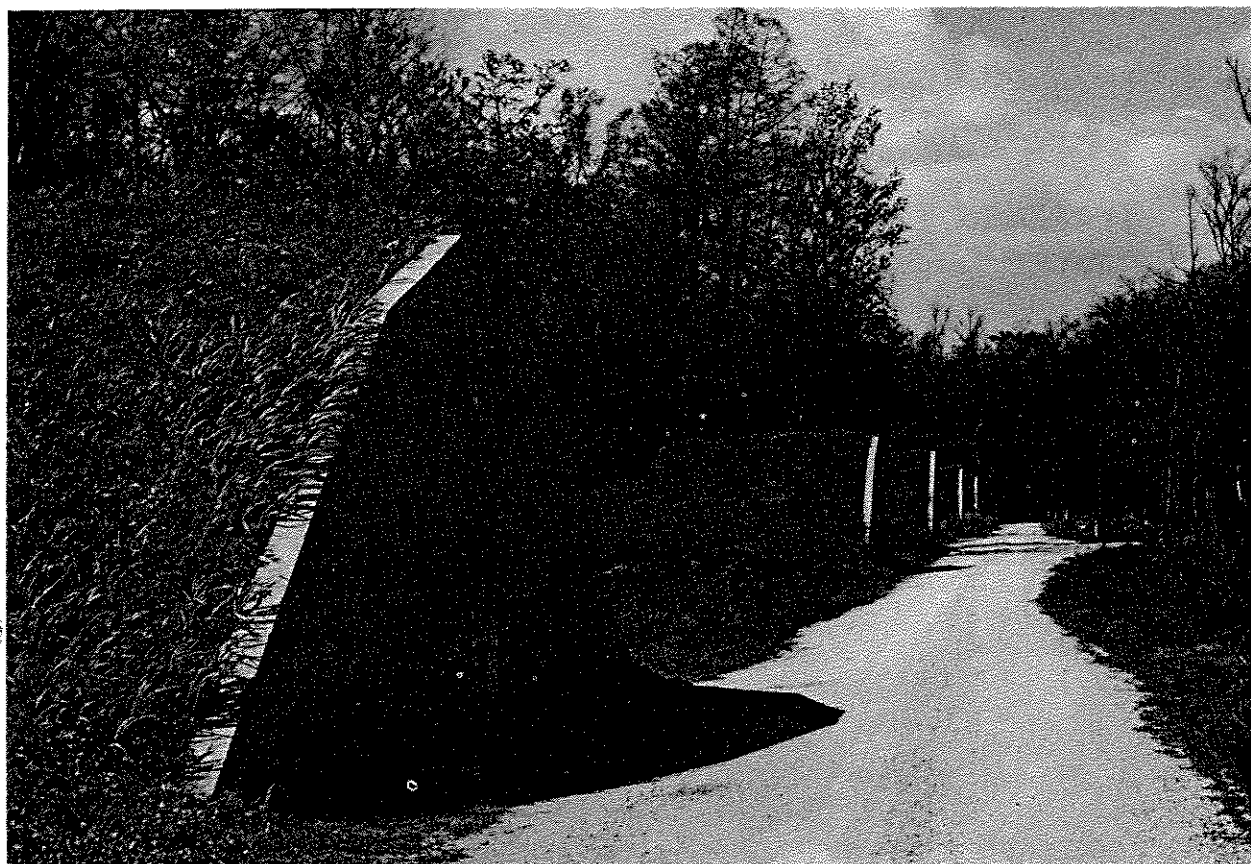
A minor site problem was posed by existing public roads and railroads at both sites. To build the private road and the railroad connecting the two areas, it was necessary first to cross over the two railroads and the highway paralleling the Sacramento River inland from the tidewater area. Two public highways crossing the inland area were to be kept in service, so overpasses were built at the two points where these roads crossed the station's backbone rail and road.

Earle.—Earle Naval Ammunition Depot was the second shipping facility. It was undertaken in the middle of 1943 when the construction of a large ammunition shipping depot in the New York area

fixed the pier location in New Jersey on Sandy Hook Bay. The nearest practicable storage area, however, was a wooded swampy tract about 12 miles inland, about equidistant from Red Bank, Asbury Park, and Freehold. The main station area occupied 8,419 acres. A Navy-built Army in-transit railroad yard, the right-of-way to the Bay, and a pier area added 2,651 acres.

The wharfage built at Earle comprised a two-berth wharf for Navy use, a four-berth wharf for Army use, both located in deep water and connected to the shore by a 2-mile-long pier, and a barge wharf for Navy use in shallower water at about the middle of the long pier. A 400-foot-wide channel was dredged from the ship wharves to Bayside Channel. The long trestle was 34 feet wide, providing width enough for two railroad tracks and one truck lane, and was built with a reinforced-concrete deck connected ashore to a railroad yard comprising 10 five-car barricaded sidings and by a double-track line to the storage area 12 miles inland, where 62 more barricaded sidings were built.

Because of its favorable location and up-to-date



FUSE AND DETONATOR MAGAZINES, NEW ORLEANS AMMUNITION DEPOT

layout potentialities, Earle was designated a permanent unit in the shore establishment, and construction was conducted accordingly. Limitations calling for temporary design were waived. This permitted the building of fire-resistant structures for most of the inert storehouses, personnel, administration, and service buildings. In the earlier stages of Earle's development these structures were built with brick bearing walls, concrete decks, wood roof-trusses, and tile interior walls. Later personnel buildings were of wood frame with brick veneer and plaster-board walls. Part of the barracks buildings had waterproofed concrete-block walls with wood decks and roofs.

The station's site was mostly swamp and covered with underbrush, a condition which caused many construction difficulties. Even before proper access roads could be built, it was necessary to carry out extensive drainage operations, and much clearing and stripping were required to prepare the magazine areas for construction. At this point, another

undesirable condition came to light. The subsoil was so highly erodible that after every rainstorm roadside ditches silted seriously in all areas where the overlying layer of humus had been removed. It was extremely difficult to keep earthfill on the magazines. This resulted in elaborate attempts to control erosion, including bituminous treatment, sodding, and check weirs.

In October 1942, the month work was started, the rainfall was extremely heavy. On October 25 a severe storm resulted in the loss of floating equipment used for waterside construction and abnormally wet conditions in the depot's magazine area, which was not yet provided with artificial drainage. After that, work on the pier and on the magazines slowed alarmingly and the contractor apparently was unable to overcome the difficulties encountered. To meet committed completion dates the Bureau of Yards and Docks in January terminated the pier and magazines contracts, which had been let on a lump-sum basis, and negotiated a new CPFF con-

tract. One of the first moves made by the new contractor was to drain the swamps, thus clearing the way for rapid magazine construction.

In February 1944 the second phase of construction at Earle began with award of lump-sum contracts for the four-berth Army wharf, the Army in-transit railroad yard, double-tracking the railroad to the pier, and additional personnel structures. As the days lengthened and grew warmer, work hit its stride. In mid-spring as many as 6,000 construction workers were employed. Work was substantially completed by June 1.

At the end of the main development program the magazine area included 144 single-arch high-explosive magazines, 52 earth-covered triple-arch gun-ammunition magazines, 26 fuse and detonator magazines, and 8 black-powder magazines. Other facilities included 20 storehouses, 62 five-car barricaded sidings, 160 miles of roads, 126 miles of railroads, the long pier, and barracks for 4,500 men.

Seal Beach.—Seal Beach Naval Ammunition and Net Depot occupied a 7½-square-mile area, in Orange County, Calif., on the coast just southeast of the cities of Long Beach and Seal Beach. Having about a mile of water front, it fanned out inland over an area which was tidal marsh only partly reclaimed and coastal plain formerly used for agriculture.

Construction, which took place almost entirely in 1944, provided a waterfront area for trans-shipment to barges, an industrial area which included a large net warehouse and the usual ammunition-depot shops, an administration area with permanent and temporary barracks, an inert-storage area, an ammunition-overhaul area, a high-explosive area, a gun-ammunition area, a classification and segregation area, and a barricaded-siding area.

The first construction move was to relocate the oceanside highway and electric railroad back from the shore to make room for a marginal barge wharf. To protect loading operations from the sea, an outer and an inner harbor were formed by the construction of rock-fill jetties. Rail and highway connection from the waterfront area to the remainder of the station was obtained by construction of a grade separation at the point where the station routes crossed the new public routes.

The 1,000-foot marginal wharf was built to serve as both a net wharf and an ammunition wharf. An L-shaped barricade was constructed along the land-

ward side and around the end of the ammunition portion of the wharf.

Most of the depot was built on solid ground and presented no foundation or other site problem to the contractor. However, a tide-marsh inlet had to be filled hydraulically at certain points where structures were to be erected. Settlement of the fill was slow. In the waterfront area a heavy additional fill of crushed rock was added to hasten stabilization; in the area inland from the coastal highway, building sites on solid ground were chosen. Underground utilities in the unstable fill were supported by a series of light timber H-shaped bents.

Construction labor was difficult to obtain at Seal Beach, because of intense local competition for men. As at many other new naval installations in both congested and isolated places, it was necessary to import labor from distant areas.

As developed for full service in early 1945, Seal Beach had 80 magazines, 40 five-car barricaded sidings, 21 inert storehouses, and 5 barracks, plus the service, administration, and other buildings necessary to accomplish the station functions.

Bangor.—Bangor Naval Magazine was built on a rugged 7,585-acre tract on the eastern shore of the Hood Canal, a natural inlet of Puget Sound. As developed during 1944 the station consisted of a two-berth marginal wharf, which was the focal point of its activity, 41 five-car barricaded sidings, a 250-car classification yard, 39 magazines, 9 storehouses, a transfer-and-segregation group of buildings, four permanent and one temporary barracks, and administration and shop buildings. Construction in 1945 added 68 more magazines.

The most notable feature of the Bangor construction took place outside the station proper. The nearest point to the depot on the continental railroad system was at Shelton, Wash., 45 miles to the south, and it was necessary to build a new line from that point to serve the station. Construction of this line also furnished an opportunity to provide land rail service to the previously isolated Puget Sound depot. This entailed construction of an additional 1.4 miles of track. Another spur, 4.6 miles long, was built to serve the navy yard at Bremerton.

Local-Service Depots

In addition to the great inland depots built to serve the ammunition needs of wide areas, and the trans-shipment depots specializing in ammuni-



MINE ASSEMBLY BUILDING, MARE ISLAND AMMUNITION DEPOT
Note size of barricade.

tion export, the Navy built five new stations that were similar in character and function to the ammunition depots that existed in earlier times. Two of the new local-service depots were located on the East Coast, at Cohasset, Mass., and at Charleston, S. C., one on the Gulf Coast, at New Orleans, and two were on the West Coast, at Fallbrook, Calif., and at Indian Island, Wash.

Cohasset.—The site chosen for the Cohasset Naval Magazine contained 3,744 acres and was situated inland about $2\frac{1}{2}$ miles southeast of the Hingham Naval Ammunition Depot. The new station was operated under the administrative supervision of Hingham and became a major storage point for ammunition along the North Atlantic coast.

Presenting many obstacles to construction, Cohasset's terrain was rough and wild, consisting mostly of small granite hills, with large deep

swamps between. Like most other areas taken for ammunition storage the site contained only a small amount of arable land; it had been used largely for hunting and recreation.

Construction at Cohasset included 86 earth-covered arch-type magazines, 23 earth-covered 50-by-100-foot smokeless-powder and projectile magazines, barricaded sidings for 140 cars, a mine-assembly facility, and barracks. Magazines could not be built in the swamps, but it frequently became necessary because of minimum inter-building distance regulations to locate them at the edges, where the overburden of muck had to be removed to rock at one side of the structure and space had to be blasted out of the rock to provide a proper foundation for the other side. Because of the uneven ground, some of the foundation walls had to be 14 feet high. Although roads and railroads were laid out to avoid the swamps and sharp rock out-

croppings as much as possible, a substantial amount of rock excavation was necessary, even when the engineers increased the maximum permissible highway grades from three to five percent.

In the swamps the contractor had to remove the peat muck down to firm bearing material and then to fill up to subgrade with good material. As borrow pits were not usually close by, transportation ran up the cost of such fill.

On the other hand, labor was plentiful and competent, materials deliveries were reliable, and the contractor was well equipped to handle a big job.

Charleston.—Situating about 5 miles up the navigable Cooper River from the Charleston Navy Yard, the Charleston Naval Ammunition Depot covered 10 square miles of woods, small lakes, and marshland. Its site, bounded by water on two sides, was sparsely populated prior to Navy occupation. Shortly after the beginning of 1941 the contractor began draining lakes on the site and building the rail connection to the nearby Seaboard Air-Line Railway. When construction under the first authorization was complete in February 1942, 23 arch-type magazines, 10 fixed-ammunition and shell houses, 7 fuse and detonator magazines, one 50-by-200-foot inert storehouse, one warhead magazine, and one black-powder magazine had been built. In 1942 and 1943 additional contracts added 37 arch-type magazines, 20 fixed-ammunition and shell houses, 7 fuse and detonator magazines, 3 inert storehouses, and one black-powder magazine. The United States Engineers dredged a turning basin and a 30-foot channel to serve the ammunition depot pier constructed under the first contract.

Construction in the early stages of the station's development was slowed by adverse weather conditions and by the difficulty of obtaining enough earthmoving equipment. In June and July 1941, a two-month period for which the normal rainfall for that area is about 10 inches, 37 inches fell. The roads leading to the station became impassable, and it was necessary to transport construction personnel by rail. The earthmoving-equipment problem so seriously slowed building of station roads that they were of limited use for construction access.

New Orleans.—On a point formed by a great bend in the Mississippi, 12 miles southeast of New Orleans, the ammunition depot was built. Roughly 5 miles long and a mile wide, extending in an east-west direction, with the river on its south and east

sides, the site was a long-abandoned sugar plantation, ranging in elevation from 10 feet above to a few feet below mean Gulf level. It was protected by a levee, but at the time of acquisition was poorly drained by a disused system of canals leading to a distant central pumping station. A heavy growth of pine and cypress, with dense underbrush, covered the area.

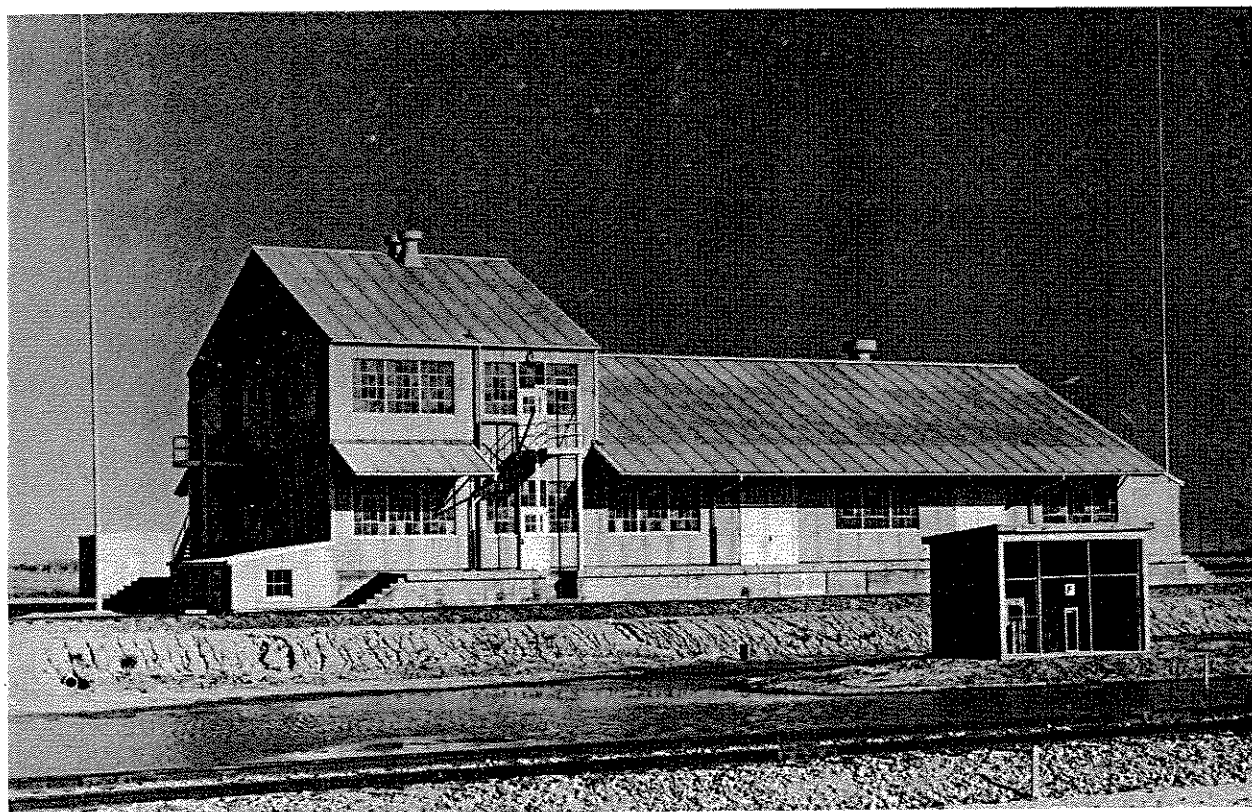
On this site there were built 64 magazines, 3 inert storehouses, administration, service, and personnel structures, and a 410-foot-long marginal wharf, together with the roads and railroad track-age necessary. River water was treated for domestic use; raw sewage was pumped into the river. Drainage of the area was reestablished by clearing the canals and by overhauling the old pumping station.

Investigation of the site led to the conclusion that wood pile foundation should be used for all permanent structures, and reinforced spread footings for frame buildings. The undisturbed earth, it was found, would carry no more than 1000 pounds per square foot, so all magazine and storehouse floors were of reinforced-concrete beam-and-slab construction, supported by concrete caps on the timber piles. The floor slabs of projectile magazines, designed to accommodate 2,000-pound-per-square-foot load, acted as continuous caps over piles spaced 38 inches each way.

Originally it was intended that the wharf should be of fireproof construction, but when concrete test-piles were driven, their use was found to be impracticable. Thereupon the Bureau of Ordnance agreed to the construction of a timber wharf. Spliced and treated 90-foot piles carried a treated-timber deck which was 21 feet above mean Gulf level, roughly at the height of the levee. The pier was designed to carry a locomotive crane and loaded freight cars.

Fallbrook.—Santa Margarita ranch, one of the early Spanish land-grants in southern California, was the site chosen for the new Fallbrook Naval Ammunition Depot, and a 9,322-acre tract was bought by the Navy in 1941 for the purpose. The site was rugged, varying in elevation from 100 to 900 feet and was characterized by rocky heights and alluvial bottomlands. Twenty miles from the seacoast, it was connected by rail and highway to San Diego, 53 miles south, and San Pedro, 90 miles northwest.

The primary purpose of the station was to store ammunition to serve the naval establishments on



BAG-FILLING BUILDING, SEAL BEACH AMMUNITION DEPOT
Corrugated asbestos-cement and a steel frame were utilized in this construction.

the southern California coast. The facilities constructed included 163 magazines, barracks, administration and service buildings, 16 miles of railroad, and 115 miles of roads and trails.

The soil was a combination of disintegrated granite, wind-blown dust, and humus, which when wet was soft and difficult to drain. Because of this, provision for the drainage of fills became an important item in the station's construction. The rough terrain introduced certain construction difficulties; access to most building sites was necessarily over circuitous routes with heavy grades. Machine excavation was generally feasible, however, in connection with both roads and buildings, as it was possible to avoid most rock outcroppings and to keep drilling and blasting to a minimum.

Forms for concrete were fabricated in a central shop. A batch plant was set up on the station to serve transit-mix-concrete trucks and dry-batch trucks. Transit-mixed concrete was used where it could be chuted directly to forms. Where it was

necessary to hoist concrete, a portable mixer and hoist were used.

Indian Island.—In 1937 a small amount of high-explosive storage had been provided for the Puget Sound area by construction of 105 tiny igloos at the Puget Sound Naval Ammunition Depot. The group covered only 7 acres of an unused station area. These small magazines were considered inadequate to support the national defense program even in its earliest phase, and the need for adequate high-explosive storage facilities was answered quickly by the authorization in 1940 of Indian Island Naval Magazine, to be operated under the administrative supervision of the Puget Sound depot.

The 2,716-acre island site chosen was a few miles south of the point where Puget Sound's maze opens westward into the Strait of Juan de Fuca. The terrain was hilly, with bluffs at the northern end sloping to beaches at the south. When acquired by the Navy it was covered with brush and second-

growth timber. The few residents of the island were mostly fishermen and clam diggers.

Under the original authorization, 25 magazines for high explosives, piers, utilities, and roads, and administration, personnel, and service buildings were constructed. Subsequent work more than tripled the high-explosive storage capacity and added a mine-assembly plant and personnel structures. No rail service was provided for the island.

To facilitate the transportation of men and materials for construction across the Sound, temporary piers and ferry slips were built both on the mainland and on the island. Power and telephone lines were constructed throughout the area, and connected to existing services at the south end of the island. Shallow wells were used for water until a permanent system of wells was built for the station.

Because of the isolated character of the construction site it was necessary to provide complete shop and repair facilities for construction equipment. A central concrete-mixing plant was set up to handle general construction, and mobile mixers were used at sites, such as those for magazine groups, where there was sufficient work to warrant an independent unit.

Miscellaneous Ordnance Facilities

Washington, D.C.—On December 1, 1945, the Washington Navy Yard, which had been established as such on March 17, 1800, was redesignated the Naval Gun Factory. Even before World War I the main function of the yard had become the manufacture of guns for the Navy. Construction in World War II began in 1939 with the building of a gun-assembly shop and an ordnance storehouse, and in the period which followed, buildings constructed and equipped included two shops, five storehouses, an administration building, a laboratory, a magazine, a mine building, and various miscellaneous structures.

White Oak, Md.—Also at the Washington Navy Yard since World War I was the Naval Ordnance Laboratory, which had been established in connection with the Navy's famous North Sea mine barrage. Its original facilities consisted of a small building and test tank. During World War II, with its problem of the aircraft-laid magnetic mine, the laboratory utilized every available space in the yard, but it soon became obvious that adequate physical expansion was impossible. Early in 1944, authorization and funds for the construction of a

new naval ordnance laboratory were obtained and work was immediately begun on a 938-acre tract at White Oak, Md. Scheduled for completion by the fall of 1947, the plant was planned to consist of about fifty permanent buildings, including the main administration and laboratory building, a test laboratory, a magnetic group, wind tunnel, ballistics and explosive groups, shops, barracks, and concomitant service structures.

An interesting construction feature was the use of movable steel partitions to permit rapid change of laboratory room sizes. Partitions were prefabricated in sections, and provision was made for their placement at 11-foot intervals. All were of ceiling height and were made soundproof.

Dahlgren, Va.—The Naval Proving Ground at Dahlgren, Va., which also had been established in World War I, was greatly expanded during the construction period which began in 1940. An additional 3500 acres were acquired, and a laboratory, 14 magazines, 5 shops, 94 quarters, a loading house, a dispensary, a storehouse, and more than three score miscellaneous buildings were constructed and equipped, and 23 miles of single-track railroad were laid to connect the station with the main line at Fredericksburg, Va.

Indian Head, Md.—Some expansion also took place at the Naval Powder Factory at Indian Head, Md., some 450 buildings being constructed, 286 of them defense housing.

Stump Neck, Md.—A Naval Ordnance Investigation Laboratory was built on 1500 acres of land at Stump Neck, Md., across Mattawoman Creek from the powder factory. It was equipped with laboratories, magazines, storehouses, and all appurtenant buildings.

Pocatello, Idaho.—The naval ordnance plant at Pocatello, Idaho, was established April 1, 1942, on a level tract of 211 acres, approximately 3 miles north of the town of Pocatello. The site was selected when it was decided that a gun relining shop to serve the West Coast navy yards should be located east of the Coast Range.

Construction was begun in the spring of 1942 and continued throughout 1943, with some portions of the plant in usable condition by the middle of the year. The station was commissioned August 2, 1943.

The principal buildings constructed during that period were the big gun shop, 352 by 840 feet and 74 feet high, capable of relining the biggest guns of the fleet, the small gun shop, and an ordnance

storehouse, together with the quarters, shops, and other facilities required for the efficient operation of the station. Later, a proof shop was added.

Still later, the scope of the plant was increased by the construction of three heavy-materials storehouses, each 352 by 605 feet, for the storage of guns and gun mounts. Each building was completely equipped with compressed air and electric power in several voltages, for use in exercising the gun mounts while in storage.

Altogether, 50 buildings were erected on the station, all except a few of them being of permanent construction.

Worthy of special mention was the construction of two furnace pits in the big gun shop. These pits, 44 feet in diameter and 86 feet deep, were constructed by sinking open caissons. The walls were of reinforced concrete. The big gun shop was also equipped with a 250-ton bridge crane, with an 83-foot span, the top of the crane rail being 45 feet above the floor.

Late in the fall of 1942, construction was started on the naval proving ground, to be used for proof-firing of guns reconditioned at Pocatello. The site selected was at Arco, 60 miles northwest of Pocatello, on a tract of 173,131 acres of comparatively level terrain. In addition to the gun emplacements and gun storage area, there were constructed 27 permanent buildings, including quarters for operating personnel, an administration building, warehouses, maintenance shops, and magazines for the storage of powder required for proof purposes.

Work at Arco was substantially complete by the late summer of 1943, and the station was commissioned August 2nd.

Montauk, N. Y.—The Naval Torpedo Test Range was established March 27, 1943, at Montauk, N. Y., on a tract of land approximately 156 acres in extent at the eastern end of Long Island, on Fort Pond Bay.

The first construction contract was awarded December 21, 1942, and construction began soon thereafter. Temporary operating facilities were available April 19, 1943, and all work on the station was completed by April 30, 1944.

Several buildings, including a resort hotel, were leased and altered to provide quarters and other services. Facilities constructed included a torpedo overhaul shop, torpedo storehouse, a hangar, and seaplane ramp, additional quarters, and miscellaneous structures. A total of 70 buildings was constructed or altered at a cost of more than \$7,000,-

000. New construction was of a temporary type, using, primarily, concrete foundations, concrete-block walls, and roll, or built-up, roofing.

Montauk was disestablished as a torpedo test range March 1, 1945, and re-established as a naval magazine on the same date.

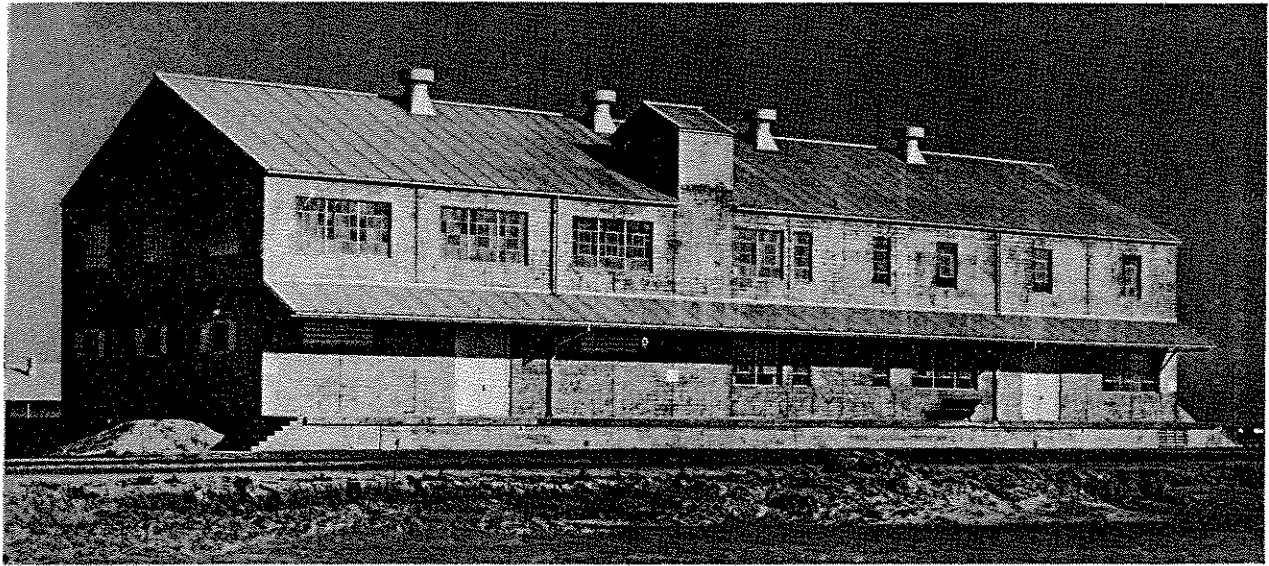
Inyokern, Calif.—Late in 1943, a naval ordnance test station was established in the Mojave Desert, 150 miles east of Los Angeles, where 750,000 acres of uninhabited land, remote from towns, offered excellent opportunities for the development and testing of new types of rocket projectiles. The site also afforded satisfactory year-round weather conditions. This very isolation, however, had a direct relation upon the amount of construction required, for not only was it necessary to build the station as such, but, in addition, complete community facilities for station and construction personnel had to be established. Also, its distance from large centers made it unattractive to labor, which was one of the main factors affecting progress of construction. Not only was the labor quantity low most of the time, but the quality also was not up to standard, with resulting high turnover. Labor difficulties were somewhat alleviated by the construction of a suitable labor camp, including barracks, commissary, and community mess facilities for construction workers.

In the earlier phases of the construction program, delivery of materials was also slow.

The station was established to provide for the research, development, and testing of new weapons. It also provided primary training in the use of the weapons developed. Projects were planned by the Bureau of Ordnance, assisted by various scientific groups, for both research and development.

The facilities were designed and developed jointly by the Bureau of Yards and Docks, Bureau of Ordnance, and the California Institute of Technology. The pioneering scientific character of the project and the rigid requirements demanded by the scientists for many aspects of the work added greatly to the difficulties of design.

Constructed facilities included buildings, magazines, transfer docks, railroads, roads, power lines, sewerage and water systems, also the installation of launching devices in the various test areas, including targets, observation towers, and other pertinent facilities. Certain phases of the work required the development of an airfield with nec-



BAG-SEWING BUILDING, SEAL BEACH

This reinforced-concrete, bag-sewing building was built as part of the ammunition overhaul group.

essary runways, hangars, and miscellaneous buildings, together with extensive improvements and developments to Harvey Field airport, outside the station. A large research laboratory and shop building, intended primarily for basic and applied research activities in connection with fire control, rockets, including all components thereof, guided missiles, torpedoes, and other similar weapons, was included in the project.

Barracks, officers' quarters, and some 1500 houses for civilian and service personnel, complete with roads, sidewalks, power, sewers, and water supply, were developed. These were supplemented with schools, recreation and shopping centers, and other facilities deemed necessary for the welfare of the station personnel.

The accumulated value of the work accomplished at Inyokern was approximately \$82,000,000 by June 1946.

Shumaker, Ark.—Late in 1944 the Navy took over 70,000 acres of land at Shumaker, Ark., for the construction of a naval ordnance plant. Facilities constructed at this location included maga-

zines, warehouses, production and assembly buildings, railroads, roads, and the necessary industrial, subsistence, and housing facilities, at an overall cost of approximately \$95,000,000.

At the time of construction, the Shumaker facilities were urgently needed, particularly for the large-scale production of rockets. Construction of these facilities was particularly difficult for several reasons. First, although good bearing material was present at a reasonable depth below the surface, the top three or four feet was a soft muck requiring the installation of extensive drainage facilities. Second, the urgency for producing rockets required the immediate construction of production buildings before roads were constructed and before the land could be adequately drained. Third, design and construction had to be started simultaneously and no rocket production facilities of comparable scope had previously been designed.

In spite of the many construction difficulties encountered, however, the plant was completed sufficiently in time to produce the vitally needed rockets.

DATE OF MISSION: 9 Nov 04	RECEIVED BY: MGySgt LARTER	RETURN TIME: 1430
DATE RECEIVED: 3 Nov 04		DEPARTURE TIME: 0945
		TOTAL TIME: 6:45

REQUESTOR INFORMATION

RANK / NAME: Jim Oliver	POC OTHER THAN REQUESTOR
UNIT / ORGANIZATION: Explosive Safety	RANK / NAME:
PHONE #:	PHONE #:

NOTIFICATION FOR OFF-BASE RESPONSES

	POC UPON DEPARTURE	POC UPON RETURN
MCAS OIC/NCOIC		
PMO 725-3888		
CDO 725-5617 (AFTER HOURS/WEEKENDS)		
AC/S O&T 725-5144/5745		
MCAS SDO 763-1154		
US ARMY EOD (619) 553-8500		

MISSION / INSTRUCTIONS

LOCATION: 0800 Bldg 1

DESCRIPTION: Site Survey of former Ordnance Dump Site

PERSONNEL RESPONDING / MILEAGE

PERSONNEL: MGySgt Larter	MILEAGE: 15
	# VEHICLES: 1
	TOTAL: 15

NARRATIVE OF ACTIONS TAKEN

<p>Conducted a site survey of 4 areas on Naval Air Station, Fallbrook Del</p> <p>Site #1 was originally used to test fire reworked wpns. Area contains residue from M72 LAAGs M397 40mm HE and other munitions</p> <p>Site #2 Area has buried M25 Prac Rifle Grenades used for soil stabilization</p> <p>Site #3 is a former dump site w/ ordnance residue</p> <p>Site #4 was a burial & dump site for ordnance residue & contains live 20mm HE rounds</p>	LOT#:
	NOTES:
ORDNANCE DESTROYED QTY	N.E.W. lbs

PART 1

HISTORY OF CONSTRUCTION

1. The construction of the Naval Ammunition Depot was begun about the middle of 1941, as a peace-time project. Its size and scope were more or less limited, until the pressure of war-time demands compelled its increase and further development.

2. Before the commissioning of the Depot the Commanding Officer of the Naval Training Station in San Diego, California, was given additional duty to oversee the construction of the depot and to approve its arrangements. Before construction had gotten well under way, however, a strike of carpenters employed by the contractor, Myers Bros.--J.E. Haddock, Ltd., delayed completion for several months. The matter of completing construction by civil service workers was at one time under consideration, but the strike was finally settled.

3. The progress of construction on the Depot is probably best shown by appendix I, a map of the Depot with colored markings indicating construction by the various contractors and the Maintenance Department. Appendix II is a list of the various contracts under which the Depot has been constructed, the costs, the contractors, and the dates of completion.

4. A summary of the construction of the Depot over the war years is summarized in the following tables showing totals, where available, at the end of each year:

PART 1 (Cont'd)

BUILDINGS AND FACILITIES * 1940 1941 1942 1943 1944 1945

Buildings by Types

Miscellaneous			9	17	21	30
Administrative	1	1	8	11	13	15
Shops		4	4	7	8	14
Storehouses		1	3	10	10	17
Quarters			13	13	16	22

ROADS

	1943	1944	1945
Bituminous - Miles	35	38.79	55
Gravel "			5
Graded "		50	55

MAGAZINES - *See Page 5. - PART 2.

MISCELLANEOUS

	1944	1945
Railroads - Miles	12.44	15.7
Water Lines - Feet		69200
Sewage Lines - Feet		28430
Gas Lines - Feet	11000	11000
Electric Power Cable - Feet		

PART 2

HISTORY OF AMMUNITION DEPARTMENT

PURPOSE

1. This depot was placed in commission on 2 February 1942. Originally it was to be a production depot, but when Seal Beach was authorized, the policy was changed to make this activity a maintenance depot with the mission as follows:

Maintain basic stocks as established by the Bureau of Ordnance, store issue and accomplish exterior maintenance and minor Ordnance Alterations, handle fleet returns as directed by Bureau of Ordnance; store, stock and issue artillery ammunition, bombs, rockets, and mortar charges for stations and ships operating within the 11th Naval District; be the main supply for Marine Corps activities, Naval Air Stations and Ships.

2. The mission of this depot as defined by the Bureau of Ordnance on 11 October 1945, is as follows:

"The Naval Ammunition Depot, Fall Brook, will store and issue all types and calibers of ammunition for the San Diego Area, except 6"/53, 8", 14" and 16" caliber ammunition. In addition the Naval Ammunition Depot, Fall Brook, will supply bombs to activities in the San Pedro area as well as the San Diego area and to the Naval Ammunition and Net Depot, Seal Beach, when required for vessels in the San Pedro Area."

3. The 11th Naval District through the District Ordnance Officer screens and directs the issue of all ammunition to ships and stations excepting

PART 2 (Cont'd)

Naval Air Stations, which is screened and directed by Ordnance Officer, Naval Air Bases. Instead of dealing with many ships and stations individually with the vast amount of paper work involved, V-J Day had this depot dealing with the following Offices only:

Bureau of Ordnance

Com Western Sea Frontier

ComPhibTraPac

Com Naval Air Bases

District Ordnance 11th Naval District

Prior to the middle of 1944 this was not the case, resulting in occasional disorganization because of late, inconsistent, or improper ammunition orders.

CONSTRUCTION

1. As noted on the construction Map, Appendix I, the number of magazines under the original contract and its supplement was 132.
2. The depot later installed 19 temporary shelters (canvas covered) for ship's temporary storage, 12' X 200', each spaced 150 feet apart within the group, and groups spaced 2000 feet apart, taking full advantage of contours. The selected spaces were scraped and bladed free of grass and vegetation, next a pallet board floor was laid, then a skeleton frame with apex roof was erected. Tarpaulin spread over the frame and battened down to the ground on the windward side leaving the lee side 1 foot from the ground to allow escape of latent heats afforded ventilation and access from the lee side. The Bureau of Ordnance disapproved this method of storage and directed that explosives be placed in magazines. The exigencies

PART 2 (Cont'd)

of the war would not allow this immediately but it is now being accomplished with the exception of inert material which is over and above the capacity of the inert buildings.

3. Eight temporary experimental earth covered unbarricaded Armco huts, 12' X 50' were installed for segregation of explosives pending Bureau's decision or awaiting accumulations for dumping in deep water. These segregation magazines are spaced to comply with the table of distances and House document 199. Three box type magazines are used to receive, sort, separate, and inspect live fleet returns and ships' temporary storage ammunition.

4. Thirty nine new magazines were completed in July 1945 by contractor (Shanahan Bros.) as follows: 6 - Fuze & Detonators, 3 - Pyrotechnics, 15 - Gun ammunition and 15 - High Explosives.

5. A summary of the number of magazines by types over the history of the depot is as follows:

	1942	1943	1944	1945
Pyrotechnic	3	3	3	6
Fuzes and Detonators	13	13	13	19
High Explosive	74	74	74	79
Black Powder Magazines	5	5	5	5
Y-Gun Charges			1	
Inert Storehouses	7	7	7	7
Standard Earth Covered	26	31	31	40
F.S. Smoke Drum	4	4	4	4
War-Head Magazines	1	1	1	1
Triple Arch				10
Totals	133	138	139	171

PART 2 (Cont'd)

6. Miscellaneous construction includes: (1) a recently installed 12' X 50' Field Smoking Armco Hut; (2) two temporary shelters installed for surface overhauling of depth charges and storage and overhaul of lug guards; (3) a Mk. 6 pistol testing building erected and placed in commission for servicing of depth charge accessories, arbors, etc.; (4) a metal dunnage site; (5) an incendiary burning pit erected, successfully operated, and approved by the Bureau of Ordnance; (6) seven terraces bladed off to receive and store tanks, cases, and empties.

7. The depot has recently commenced the construction of a loaded truck storage site in the south section of the depot. Advantage has been taken of the contours by benching a circular road around a natural knoll and then making 6 tunnels thru the knoll, each to house or provide a natural barricaded tunnel with roof for 5 trucks and trailers in each tunnel, to await caravanning or dispatching out to ships or stations, thus increasing safety and allowing the drive-ways in front of high explosive magazines to be clear for work therein.

SPECIAL AND MISCELLANEOUS PROGRAMS

1. In early 1945, the Ammunition Quality Evaluation Laboratory was set up with the established purpose of the periodic testing of the functioning characteristics of all munitions in order to prevent the issue of defective ammunition, to remove from service ammunition found to be defective, to determine insofar as practicable the cause of the component defect, and to provide the Bureau of Ordnance and

PART 2 (Cont'd)

other interested activities with data on the rate of deterioration of all types of ammunition. This laboratory was the first of its type to be established and is expected to be followed by new similar laboratories to be established in the near future at other Naval Ammunition Depots. This laboratory was set up with temporary structures as follows:

No. of Bldgs.

1	Office (14' X 50' Armco Hut)
1	Inert Stowage and Power House (14' X 50' Armco Hut)
1	Chemistry Laboratory (14' X 50' Armco Hut)
1	Machine Shop (14' X 25' Armco Hut)
4	Stripping and Breakdown Huts (14' X 25' Armco Huts)
1	Drop Test House (14' X 26' wooden structure)
3	Magazines (14' X 25' Armco-Huts)
3	Primer - detonator Magazines, Ex Gas Chamber 10' X 5'.

2. A Mk. 8 Depth Charge barricaded installation was placed in commission in the middle of 1944 for the purpose of the "balancing" of Mk. 8 Depth Charges.

3. The palletizing program at this depot was initiated about March 1944 for the purpose of conserving magazine storage space, manpower, and time. As the palletizing program progressed this depot operated under an extreme handicap with a limited amount of industrial handling equipment. Finally when properly presented to the Bureau, ample explosion and spark proof fork lifts were received, but the maintenance service building (which is the depot electrical shop) was never adequate

PART 2 (Cont'd)

or properly arranged for this servicing. A new separate building has been requested in the 1945 budget. At present, 86% of all inert materials and 35% of all live ammunition on the depot is now palletized. It is intended to palletize 45% more of the live ammunition in the future.

4. A dunnage carpenter group was organized under the Ammunition Department separated from the Maintenance department carpenter gang. This proved most successful in meeting load-out specifications in compliance with Interstate Commerce Commissions ruling, and proper care of the lumber stock pile and salvage yards. This arrangement is recommended for all depots in connection with R.R. and trucking, cribbing, shoring and properly securing loads for transit.

MOBILE EQUIPMENT

1. Equipment presently employed in the field is as follows:

- 3 Trucks assigned to Dunnage Carpenter group.
- 37 Squad Trucks each with a squad leader, checker and average 10-12 men on each.
- 24 Passenger carrying vehicles assigned to Officers and Supervisors.
- 3 Scooters
- 22 Electric Fork Trucks
- 8 Diesel Fork Trucks
- 23 Magazine Crane Trucks
- 27 Motorized Hand Pallet Trucks
- 34 Non-Motorized Hand Pallet Trucks
- 7 Major Caliber Projectile Trucks

PART 2 (Cont'd)

ORGANIZATION

1. In 1944 a reorganization of the Ammunition Department was made by assigning an officer, assisted by a CPO or a civilian ordnanceman, in direct group supervision according to the list below. Prior to this time, group activities were under no specific responsible authority.

Under the Ammunition Officer's Direct Control

Office at
Administration
Building-----

1. Ammunition Officer
2. Ammunition Clerk
3. Shipping
4. Basic stocks and salvage
5. Records and coding

Under the Field Ammunition Officer's Control

Office at
Transfer
Building-----

6. Smokeless powder and gun ammunition
7. Temporary storages for ships or stations
8. H.E. Bombs
9. Rockets, all types including H.E.'s
10. Fuzes, Detonators, Pyrotechnics and Black Powders.
11. Palletizing, Materials Handling school and
Inert Buildings
12. Belting and inert Fleet Returns, empties, etc.
13. Depth Charge testing and Handling, issues etc.
14. Field transportation, intra-Depot and squad
coordination
15. Physical Inventory

PART 2 (Cont'd)

16. Restricted and unserviceable materials

17. Inspections, surveillance tests and Production of samples.

2. Drivers and trucks together with the dispatching was controlled by the Transportation department. All ammunition handling, in, out, and intra-depot, was done and directed by the Ammunition department. This depot from commissioning to V-J Day, maintained a one shift system although at times in order to meet the demands of Force Commanders and the District Ordnance Officer it was necessary to work squads 12 to 20 hours in a single day to accomplish the tasks. The field was divided into two watches, and late work was not done by the same squads two nights in succession. Nevertheless, between 15 July and 15 August 1945 much thought was given to organizing a second shift, in the interest of safety, as the fatigue factor was evident, and in a few cases safety measures became lax when working under Schramm lights with inexperienced ammunition handling crews under training.

3. Total personnel attached to the Ammunition Department as of 15 September 1945 was as follows:

Officers	22
Enlisted	320
<u>Civilians</u>	<u>71</u>
Total	413

ACCOMPLISHMENTS AND PROBLEMS

1. Every demand or request upon the Naval Ammunition Depot was treated

PART 2 (Cont'd)

as an emergency and met, with no exceptions, during its history. It is felt that this Department has accomplished a most difficult task despite its stupendous work load (see appendix III) and despite the many problems that have been encountered. On general, a few of the problems encountered by the Ammunition Department were as follows:

- (a) The ever changing personnel situation of civilians being drafted, ammunition handling by negro enlisted personnel wherein 13% were illiterate, the complete exchange of enlisted negro ammunition handling crews to white when the work load was at its peak in the middle of 1945, and the constant training of inexperienced personnel.
- (b) The District being unable to handle palletized packages.
- (c) Rocket and mortar ship developments and changes.
- (d) Restricted components within the various assemblies that could not be issued, and occasionally with large stocks on hand.
- (e) The reluctance of ships to accomplish any paper work in connection with fleet returns or ships temporary stowages when the ships were in port under repair (Only two exceptions to this were ever encountered). This results in the Naval Ammunition Depot being at a loss to identify the materials with the proper ship.

PART 3

HISTORY OF THE TRANSPORTATION DEPARTMENT

BACKGROUND

1. The Transportation Officer was assigned and the Department was organized during August 1942. The function of the Department was the transfer of ammunition on the depot; deliveries of ammunition to the forces afloat in the San Pedro and San Diego areas and the landlocked airfields and training centers in Southern California; and the furnishing of transportation for all depot activities.

2. At the time of organization the only motor vehicles were a number of pickups and light trucks. The increase in the number of vehicles operated throughout the history of the Naval Ammunition Depot is shown in the following table:

<u>Aug.</u>	<u>Dec.</u>	<u>Dec.</u>	<u>Dec.</u>	<u>Dec.</u>
<u>1942</u>	<u>1942</u>	<u>1943</u>	<u>1944</u>	<u>1945</u>
40	108	189	303	364

3. Magazines were being built and ammunition was being received in increasing quantities each day. In the beginning of course, orders for ammunition were few, but the tremendous increase as the War Effort in the Pacific gained momentum was foreseen. The actual increase is shown in the table below which lists the monthly averages of ammunition orders issued over the years:

<u>1942</u>	<u>1943</u>	<u>1944</u>	<u>1945</u>
190	425	615	690

PART 3 (Cont'd)

Procurement of Personnel and Motor Vehicles was started. Plans for expansion of garage facilities and equipment were initiated. Safety standards and operating procedure were set up. Depot regulations applying to shipment of ammunition made on Public Highways were written and put in operation. A preventative maintenance program for motor vehicles was started.

ORGANIZATION

1. At the time of organization, the Transportation Department was a part of the Maintenance Department and was supervised by a road foreman who had cognizance over a service garage in the Industrial area, a small wash room and a grease rack. There was no parts room or spare parts, and no provision for parking or storing vehicles. When the war ended the organization, in general was as follows:

Transportation and Assistant Transportation Officer with cognizance over:

- a. Office personnel
- b. Dispatch desk
- c. Roundhouse
- d. Bureau of Ordnance Equipment
- e. Grease rack
- f. Garage and Squad Drivers
 1. Body shop
 2. Paint shop
 3. Battery maintenance
 4. Parts Room

PART 3 (Cont'd)

g. Chauffeur Shack

1. Tire repair
2. Tire maintenance
3. Wash rack

PERSONNEL

1. A table showing the enlisted and civilian personnel employed by the Transportation Department during its wartime history is as follows:

	<u>Chauffeurs</u>		<u>Mechanics</u>		<u>Clerical</u>		<u>Other</u>		<u>Total</u>	
	<u>Enl.</u>	<u>Civ.</u>	<u>Enl.</u>	<u>Civ.</u>	<u>Enl.</u>	<u>Civ.</u>	<u>Enl.</u>	<u>Civ.</u>	<u>Enl.</u>	<u>Civ.</u>
1942	6	8	4	2	2	1	18	0	30	9
1943	10	16	12	5	4	2	17	0	43	23
1944	48	19	32	9	6	3	30	1	111	33
1945	69	26	45	6	10	7	24	1	148	40

ACCOMPLISHMENTS

1. The accomplishments of the Transportation Department are best shown in the following table listing the tonnages that were shipped out of the Naval Ammunition Depot by truck:

	<u>TONNAGE</u>			
	<u>1942</u>	<u>1943</u>	<u>1944</u>	<u>1945</u>
JAN		778	4672	9594
FEB		1067	3964	6053
MAR		1907	4801	7329
APR		1086	5143	9399
MAY	89	1245	2533	9472

PART 3 (Cont'd)

	<u>1942</u>	<u>1943</u>	<u>1944</u>	<u>1945</u>
JUN	280	1030	4114	11940
JUL	120	5605	4697	
AUG	274	1783	4269	
SEP	360	1999	4430	
OCT	393	2694	5462	
NOV	654	3410	4861	
DEC	<u>3822</u>	<u>3672</u>	<u>5073</u>	
TOTALS	3992	26269	53979	53797

SAFETY

1. The Transportation Department has always been alert concerning safety standards. This is reflected in the experience indicated by the following table. (From March 1942 to Aug. 1945, there were approximately 75 civilian mechanics and chauffeurs employed at various times.):

CIVILIAN EMPLOYEES INDUSTRIAL ACCIDENTS

1942	1943	1944	1945	Total	No. Lost Time	Compensable
1	0	9	8	18	17	1

ENLISTED MEN INDUSTRIAL ACCIDENTS

1942	1943	1944	1945	Total	No. Lost Time	Compensable
0	0	1	0	1	0	1 Fatal

2. The following table shows the vehicular accidents during the war-time history:

MOTOR VEHICLE ACCIDENTS

	<u>1942</u>	<u>1943</u>	<u>1944</u>	<u>1945</u>	<u>Total</u>
Personal Injury	0	3	4	7	14
Property Damage	1	4	15	19	39

PART 3 (Cont'd)

All accidents, regardless of how slight, were reported and investigated. A number of the personnel injury claims were for the driver of the other car or passenger and was entered to enhance the Property Damage claim. There was no Personal Injury accident or claim involving a pedestrian. Property Damage reported accidents also include those accidents where no other car was involved, running into ditches, etc.

3. Chauffeurs involved in these accidents were divided as follows:

Enlisted 17

Civilian 20

Of all the claims reported, no claim for Personal Injury was recommended for payment by the Judge Advocate General and in only eight (8) of the Property Damage claims was liability admitted and payment recommended. The majority of the accidents were caused by careless operators of other vehicles, running into the rear or side of trucks in convoy or cutting off or running their convoys at intersections.

4. From March 1942 to March 1943, there was only one minor property damage accident. During this time, a convoy escort was furnished by the State Highway Patrol. These Officers, having been trained in this work, were of untold help assisting the chauffeurs in cases of emergency. This service was discontinued by the state and convoys of ammunition were always on the Highway with an NAD escort.

RECOMMENDATIONS

1. At a depot isolated as is this one, the procurement of competent

PART 3 (Cont'd)

civilian personnel is critical. The shortage of adequate housing facilities, the numerous war time jobs available near cities and other large industrial areas makes only incompetent personnel available for chauffeurs and mechanics. Mechanics and Chauffeurs should be trained enlisted men and when assigned to an activity, should be permitted to retain that billet for the duration of the emergency.

2. The motor vehicles assigned should be standardized instead of being a conglomeration of vehicles. By standardization, the operating cost would be minimized, less spare parts would be required and repair operations would be standard for all vehicles.

3. The necessity of a comprehensive transportation maintenance program and the benefits derived are well illustrated at this activity. Because of the nature of depot deliveries of ammunition, motor vehicles have been on the road week after week on a twenty-four (24) hour schedule. All the motor vehicles that were originally assigned and those acquired through the years are in good operating condition. Only two (2) pickups and two (2) stake trucks have been placed out of service and these trucks were involved in accidents and were beyond economical repair. At many activities, motor vehicles were placed out of service and turned over to the Material Redistribution and Disposal Center. When the procurement of vehicles was very critical, fifteen (15) of these vehicles were obtained, rehabilitated and are in use every day and have been for the past year and a half. This activity has ascertained that the best way to carry out a balanced maintenance program is to assign a group of mechanics to this work who do nothing

PART 3 (Cont'd)

day in and out but check vehicles. By this method, a set number of vehicles are checked each day, minor defects are cured promptly and breakdown on the highway is practically eliminated.

4. The cognizant Bureaus should provide personnel and equipment sufficient to meet requirements for truck escorts along the highway. The personnel could be trained at the depot and by associate or comparison driving with Highway Patrolmen.

HISTORY OF SUPPLY DEPARTMENT

BACKGROUND

1. When the first Supply Officer reported for duty in January 1942, the following work started immediately: Official publications were requested, necessary initial office supplies and materials were ordered, and authority was requested from the Navy Department by the Supply Officer, via the Commanding Officer, to hire Group IVB Personnel. On February 2, 1942, the date of Commissioning the Depot, one civilian storekeeper and one clerk stenographer reported aboard and immediately set up all necessary files in accordance with the Navy Filing Manual. On March 1, 1942, all Accounting and Disbursing records for Civilian Payrolls as well as Military Rolls were transferred to this activity from the 11th Naval District Headquarters. On April 1, 1942 NSA and APA Stores Accounts were transferred from the Naval Supply Depot, San Diego, California which was followed by the establishment of the General Mess and the set up for provision records for rendering returns in July 1942. The first two Military Storekeepers reported aboard June 1942 and C&SS was established during the month of Dec. 1942.

WARTIME EXPANSION

1. The clerical force moved from temporary quarters in the Contractor's Offices to the new Administration Building on February 1942 and a magazine was used as a temporary storehouse until completion of the General Storehouse in April 1942.

PART 4 (Cont'd)

The general Storehouse (150' X 50'), the paint locker (18' X 22'), the diesel oil and gasoline storage tanks of 10,000 gallon capacity were accepted by the Navy in April 1942 which necessitated the expansion of office quarters and in June 1943 a portion of the Supply Department was moved to the North Wing of the Administration Building which up until that period of time had been occupied by the Ammunition Department. The Ammunition Department then moved to the East Wing which was a new addition to the Administration Building. An Addition was added to the galley in May 1944, which served as a dry provision storehouse, and a Shipping Office was established in June 1944 and an addition to the Transfer Depot. In November 1944, a lumber yard was placed in operation, under cognizance of the Supply department and a space of 100' X 400' was assigned as a lumber storage area and approximately 250,000 board feet of lumber are now in the Naval Supply Account stores. A competent civilian was employed to take charge of the lumber storage. In early 1945, two new gasoline tanks with 20,000 gallons capacity were installed and placed in operation. Two dispensing pumps were also installed. Previously there was some difficulty in keeping an adequate supply on hand due to limited storage capacity. Issues now average 45,000 gallons per month.

OPERATIONS

1. Supply Department (General): On July 1, 1943, the requirements of rendering APA Stores Accounts was discontinued by the Bureau of Supplies and Accounts. Accounting by money value for APA was discontinued

PART 4 (Cont'd)

2. Supply Department (Shipping Section): In April 1942, the first outgoing shipment of ammunition was made by rail freight. Bills of Lading and Store Invoices were prepared. The volume of shipments grew steadily and the work week was increased to 48 hours and later to 54 hours. By October 1942 all Supply personnel in Shipping were working seven days per week. On July 1, 1943 a contract was let with the Savage Transportation Company of San Francisco to haul ammunition on a time basis in Orange, Ventura, Los Angeles, and San Diego, counties. Total value of the contract for the fiscal year amounted to \$150,000. On July 1, 1944, Southern California Freight Lines was awarded the trucking contract for the fiscal year of 1945. The total value of this contract for the year was \$200,000. The Savage Transportation Company was again awarded the contract for the fiscal year 1946 and the total value of that contract is expected to amount to \$70,000. The maximum number of invoices written in any one month was 856 during January 1945, and the maximum number of Government Bills of Lading was 492, written in August 1945.

3. Supply Department (Purchase Section): The Requisition and Order Section of Incoming Stores Group was established in April 1942, and Sundry Purchases up to \$500.00 made in open market in the manner Common Among Business Men were authorized for items non-technical in Nature or articles not listed as standard. All items over \$500.00 in value, unless standard, were obtained by requisition to the Bureau of Supplies and Accounts for approval and purchase. The above procedure

PART 4 (Cont'd)

was too slow to meet the requirements of activities greatly accelerated by war, consequently, deliveries of urgently needed equipment and materials were retarded. The Bureau of Supplies and Accounts quickly observed the effects and established seven Navy Purchasing Offices in cities strategically located in great market areas. Subject to purchasing policies for field activities promulgated by the Bureau of Supplies and Accounts, the purchasing offices were authorized to make purchases over \$500.00 as well as having authority to consummate contracts. The Navy Purchasing Office, Los Angeles, has proven to be invaluable to this activity by its many contacts for making purchases and expediting deliveries.

a: In October 1942, one officer of the Supply Corps was designated Purchasing Officer for this Depot on a full-time basis. In January, 1943, one civilian clerk, CAF-2, was assigned to the Purchasing Section as Assistant for Procurement. A CAF-4 rating was authorized for the same position in April 1945, when the purchasing section was enlarged to include an additional CAF-3 rating.

b: Receipts from purchase chargeable to the station maintenance allotment began in April 1942 (See appendix IV). The nominal amount of \$2,012.00 was total receipts from purchase for the first month but the acceleration of Depot requirements rapidly increased this amount until a high of \$55,597 was reached in September 1944. The monthly average for the year 1944, through June 1945, was approximately \$32,000.00

PART 4 (Cont'd)

As the end of the war with Japan seemed assured, expenditures dropped sharply to approximately \$13,000 for the month of September 1945.

c: The consolidation of all lumber on the station, other than salvage, into a single lumber yard where it was maintained in Naval Supply Account Stores and controlled directly by the Supply Department, was probably the most constructive single step taken toward keeping this vital material under constant surveillance. Undoubtedly, proper control and handling of the lumber constituted sizeable savings in one of the war's most vitally needed materials.

4. Supply Department (Incoming and Outgoing Stores Section, GSK Warehouse Operation):

a: As stated earlier, a magazine was used as a temporary storehouse until completion of the new GSK Warehouse in April 1942. As the out-set 20 classes and 500 items were carried in the warehouse which has increased to 45 classes and 2,000 items at the present time. All items required by open purchase and not carried in GSK are ordered by the Purchasing Section.

5. Supply Department (Commissary).

a: The commissary was established in July 1942 during the construction of the Depot and was set up temporarily in a large tent as a combination galley and mess hall. All military personnel were subsisted in this way until the commissary building, consisting of 3 mess halls and a galley, was completed in July 1942. The complement of 6 cooks

PART 4 (Cont'd)

and bakers under the supervision of the Chief Commissary Steward were assigned to prepare food for approximately 50 men which number rapidly increased to around 100 men by December 1942. The commissary building which consisted of a large mess hall, seating nearly 400 men, a smaller mess hall with a capacity of about 150 men, a mess room for officers accomodating approximately 40, and the galley, was commissioned in December 1942. The complement of the station increased gradually until a level of nearly 800 military personnel was reached in January 1944. This number which included officers were subsisted in the general mess and this performance was maintained until early in August 1945 when the high peak of complement of 1200 men was reached for the station. Early in 1944 a scullery and garbage locker were added to the commissary building. These wer located in such a manner as to facilitate the cleaning of mess gear and galley ware, and disposal of garbage in a sanitary and safe manner. In June 1944 a Dry Provisions Storehouse and Loading Dock was established as an addition to the commissary building.

6. Accounting Department (Civilian Labor Rolls Section).

November 1942 the full-time employment of one clerk was used to process all operations in the preparation and payment of payrolls. January 1943 an additional employee worked half-time in the Time Section and half-time in the Cost Section. In July 1944 Disbursing for Civil Rolls separated from the Time Section. Total number of employees carried on Civilian Labor Rolls were: June 1942 - 63; June 1943 - 138;

PART 4 (Cont'd)

June 1944 - 267; June 1945 - 248. A revised Civilian Labor Accounting and Time-keeping system is to be inaugurated, effective December 1945.

7. Accounting Department (Naval Supply Account Stores, Accounting Section):

a: Naval Supply Account Stores Accounting was taken over from the 11th Naval District, April 1942, and handled by Civilian Employees together with APA Accounting, this entailed maintenance of a Class Ledger, Cost Records, Stores Returns and the furnishing of Plant Property information to the District as necessary. In October 1942, the expansion of Depot functions increased the accounting work to such an extent that more efficient methods of accumulating accounting data were initiated, such as segregating stub requisitions by expenditure accounts periodically during the month in lieu of segregating the entire month's lot at one time.

b: In May 1944, further increase in accounting work necessitated the assigning of additional civilians to this section. During April, May, and June of 1944, the first physical inventory of Plant Property in Classes 5 and 6 - Plant Appliances and Machine Tools, was taken. The Accounting Section handled all paper work for the above physical inventory, checking inventory against copies of the records held by the District, accumulating sufficient information on equipment not already in Plant Account, and working with District Plant Account Officer in expediting the completion of the inventory. As of June 30, 1944 accountability for the Plant Account was turned

PART 4 (Cont'd)

over to this activity, with the exception of Mobile Equipment, the value of which was taken out of this activity's plant account and taken up by the District. In August and September, 1944, the initial inventory of Classes 2, 3, 4, 7, and 8 was taken and the values taken up in the Plant account.

c: In June of 1945, when the new Accounting System was presented, the Accounting Section studied and analyzed the system, initiated forms for reporting labor charges which would assure the proper account being charged, and indoctrinated each department of the depot in the correct use of the new system. Concurrently with the inauguration of the new Accounting system, the Bureau of Ordnance issued new instructions for accounting at Naval Ammunition Depots, requiring the accounting for Bureau furnished materials and the reporting of the estimated value of military labor based on civilian wages.

8. Disbursing Department (Military and Civilian Labor Rolls):

a: The disbursing office opened in March 1942 and prior to that date, all disbursing was maintained at the 11th Naval District, San Diego. In March 1942 the complement of the Depot was four officers and one enlisted man with a total disbursement of \$1,451.00. In June 1945, there were 47 officers and 701 men receiving \$67,271.54 in pay, which was 46 times the disbursement of March 1942. Civilian payrolls have made spectacular growth from 46 employees in March 1942 receiving a sum of \$5,062.11, to 256 employees in July 1945, receiving a sum of \$64,987.77. On the receiving end of the Disbursing Office, the

PART 4 (Cont'd)

clothing and Small Stores sales have increased from \$392.62 in Nov. 1942, the first month of operation, to \$3,095.49 in August 1945. A total of 3,000 allotments have been registered and stopped since commissioning.

PERSONNEL

1. The following chart indicates the growth of the Supply Department in relation to Military and Civilian personnel:

<u>Month and Year</u>	<u>Officers</u>	<u>Cooks & Bakers</u>	<u>Storekeepers</u>	<u>Civilians</u>
Feb 1942	1	0	0	2
Jun 1942	1	0	0	7
Dec 1942	3	6	5	9
Jun 1943	3	12	12	12
Dec 1943	3	14	13	11
Jun 1944	4	17	21	12
Dec 1944	2	20	23	15
Jun 1945	3	18	22	16
Sep 1945	3	20	22	17

PROBLEMS

1. Upon the Commissioning of the depot, an intensive training program was found immediately necessary for all newly hired Civil Service personnel since only two persons reported to the depot who were previously trained in Civil Service.
2. The problem of procuring adequate and well-trained, experienced employees was aggravated throughout the war due to the isolated location

PART 4 (Cont'd)

of the base.

3. The constant turnover of Civil Service personnel, mainly service men's wives, made systematic planning in relation to the organization of personnel exceedingly difficult. Another difficult problem was that of training a relatively small staff for numerous and varied duties, and consolidating all functions of the Supply Corps that normally would be broken down considerably at any large Supply activity. The need for training military personnel in disbursing, general supply, and commissary (cooking), was apparent at all times. Training classes were established with periodic examinations in all of the above branches.

ACCOMPLISHMENTS

1. It is felt that the Supply Department successfully met the exceptionally heavy requirements and pressure of wartime. The initial workload and the ever-increasing amount of work throughout the war years were absorbed and all work was accomplished correctly according to regulations and with dispatch.

HISTORY OF MAINTENANCE DEPARTMENTORGANIZATION BACKGROUND

1. The original maintenance of the Depot was carried out by the original contractor's forces. Fortunately some of the Contractor's personnel were later hired in key Civil Service maintenance positions. In February 1942 a line officer was assigned as Maintenance Officer. Various other line officers later served in this capacity. In December 1942 a civilian Mechanical Engineer was employed as a nominal civilian head of the Maintenance Department (resigned in January 1945). In October 1943 a CEC Staff Officer was assigned to the Department. Engineering has since been handled by line officers in conjunction with administrative duties.

2. The present organization of the Maintenance Department is as follows:

a. Officers

1. Maintenance Officer (Executive Officer)
2. Assistant Maintenance Officer (CEC)
3. Two Assistant Maintenance Officers (line)

b. Shops, Maintenance Crews, etc.

1. Carpenter Shop
2. Machine Shop
3. Welding and Blacksmith Shop
4. Paint Shop
5. Sheet Metal Shop

PART 5 (Cont'd)

6. Plumbing Shop
7. Sail Loft
8. Quarters and Grounds
9. Janitors
10. Electric Shop
11. Engineering Department and Office
12. Quartermaster - Buildings and Grounds
13. Roads and Drainage
14. Labor Crew
15. Railroad Maintenance
16. Heavy Equipment Garage
17. Water and Sewage System
18. Grange and Heavy Equipment
19. General Work Detail
20. Warehouse and Storage
21. Incinerator and Salvage
22. Telephone, Fire Alarm and Radio
23. Boilers and Heaters
24. Quartermaster - Public Works

POWER AND WATER

1. For purposes of indicating the power and water consumption on the Depot over the War years, appendices VIII and IX are charts showing respectively the number of kilowatt - hours of electricity consumed and the number of gallons of water pumped on the Depot per

PART 5 (Cont'd)

month. Appendix X, the number of persons aboard the station per month, is presented for purposes of comparing the power and water consumption against the population.

PERSONNEL

1. A table showing the personnel employed by the Maintenance Department is presented below. It is to be noted that a large number of naval personnel were assigned due to the limited number of civilian personnel available:

<u>Civilian</u>	<u>1942</u>	<u>1943</u>	<u>1944</u>	<u>1945</u>
Dec	7	51	73	76
Jul		45	75	79
<u>Enlisted Personnel</u>				
Jul		25	97	91
Nov				78
Dec		62	94	
<u>Officer Personnel</u>				
Jul	1	2	4	4
Nov				3
Dec		4	4	

PROBLEMS AND RECOMMENDATIONS

1. The following list indicates some of the many difficulties encountered by the Maintenance Department during its wartime history. Although they are mostly local problems it is felt that perhaps their presentation would be noteworthy in prevention of similar problems.

PART 5 (Cont'd)

at other new activities.

a. Because the original maintenance was done by the contractor no data, catalogues, operation or installation instructions or diagrams, serial numbers and parts lists were retained for future use by the Maintenance Department.

b. Many drawings and plans not available until late, and then of inaccurate and insufficient detail.

c. The original design should have considered fire hazards from grass and brush fires, located magazines and roads with this in mind, and should have included a planned system of fire breaks and fire roads in the original construction.

d. Due to the erosive type of soil, it would have been more economical had the original contract included some soil protection measures and sodding or planting on earth covered magazines. Planting should have been a fire resistant, dry weather plant not demanding cutting (e.g. - ice plant).

e. Because the original plan of the Depot was without logical provision for expansion of the administrative, industrial, personnel, and other areas, the costs were greatly increased when expansion did occur.

f. A traffic study of the road system before it was build would have indicated the errors in its design in grades, curvature, distances, turning radii, traffic flow, and other important features.

g. In a station of this type, auxiliary water supplies for outlying areas should have been provided for fighting grass and brush fires.

PART 6

HISTORY OF MISCELLANEOUS ACTIVITIES

WELFARE AND RECREATION DEPARTMENT

1. Because transportation to large civilian communities has always been comparatively inaccessible to the personnel of the Depot, recreation has been a major problem. Prior to June 1944 the only recreational facilities on the Depot was a small gear locker. The town of Fall Brook cooperated in this problem by establishing two USO Centers (for white and negro Personnel) which were capably staffed and run for the use of the men assigned to this Depot. The first real recreational facilities on the Depot was the Recreation Building completed in June 1944. This building includes a gymnasium (used for movies four nights a week), a library, a pool room, ship's service and two lounges for petty officers and seamen. In August 1944 the Depot outdoor recreational facilities were opened including a swimming pool, athletic field and gear locker, lighted tennis and basketball courts, and a boxing ring.

SHIP'S SERVICE

1. In the middle of 1942, Ship's Service was established on a loan of \$500 from the Eleventh Naval District. By January 1943 Ship's Service was established in the Maintenance Building to handle a complement of 500 men. In July 1944 it was moved to the new recreation Building with new facilities including a fountain and two barber shops (not located in the Recreation Building), and was able to handle a complement of 700 men. In March 1945 a station laundry with new and

PART 6 (Cont'd)

modern equipment was completed and two new barber shops were substituted for the old. By the end of the war Ship's Service was serving over 1200 different persons each month with a monthly gross averaging \$15,000 and an average stock of \$7,000.

MEDICAL DEPARTMENT

1. The Medical Department was organized in January 1942 to care for 60 Marines who were stationed here as guards. The first sick-bay consisted of two rooms in the Marine Barracks, and a Chief and PhM2/e constituted the personnel. The present dispensary, completed in Mid 1943, consists of a 12 bed ward, 2 heads, storeroom, galley, dental clinic, doctor's office, corp quarters, record office, dressing room, pharmacy, laboratory, X-ray room, operating room, linen closet, and 2 sick officer quarters. It is considered to be complete in its required facilities as a dispensary although serious cases are sent to the Santa Marguerita Ranch Naval Hospital at Ocean-side. The present complement consists of three officers and ten corporals.

FIRE DEPARTMENT

1. The fire Department was originally organized with marine personnel with a PFC as Chief. In April 1942, the Department was on a two tour basis with 8 to 10 men assigned to each tour, and an auxiliary crew of 20 men available for emergency call. The duties consisted of inspection of facilities of the depot with a view to fire prevention, inspection of fire suppression facilities, and filling water

PART 6 (Cont'd)

barrels and tanks. The Department operated under this set-up until March 1943 answering 24 alarms, none of which were of serious nature. In March 1943 a civilian Fire Department was placed in operation with a Chief and 17 fire fighters. Most of these men had had little experience and a special training program was necessary. Particular stress was placed upon fire prevention inspection and has proven to have been worth the effort. The Department was finally brought to the full complement of 25 men during June 1943. Since March 1943 only 29 alarms have been answered where actual fire was extinguished, 7 of them being off the station. Damage to the Depot during this period has been less than \$1001.

PART 7

PERSONNEL

BACKGROUND

1. Early in December, 1941, employment of civilians for the Depot was started, and the first employee, the Chief Clerk, began duty with the Depot on 1 January 1942. Additional positions were established under blanket authority, or authorized by representations to the Navy Department as the work-load increased, until a peak of 287 were employed in July of 1944. Since that time, due to manpower shortages, the total has steadily declined, and since the end of hostilities has rapidly dropped to just above 200.

2. The lack of manpower early began to be one of the major problems on the Depot. The reasons for this have often been put before the cognizant Bureaus, and include a lack of housing, lack of availability to labor markets, and the overwhelming competition of war-time wages in war plants as compared with the rigid limitations imposed by the Government Schedule of Wages. Housing was requested in the early days of the Depot's existence, even before its commissioning, but accomplishment of housing was not achieved for about two years, by which time, the needs for housing had far outdistanced the available supply. To meet manpower needs, enlisted men were obtained and barracks and messing facilities established. The first barracks were established in August of 1942, in a series of circus tents rented for the occasion, giving rise to one of the more colorful names on the Depot "Tent City". Further additions of enlisted men required add-

PART 7 (Cont'd)

ditional barracks, and additional officers, until the on-station population of military men exceeded 1000 persons at the time of the surrender of Japan.

3. For purposes of showing the manpower on the Depot during the war-time history, appendix X, a chart of the number of station personnel aboard, is presented. This chart breaks down the personnel into the following types: civilian workers, colored enlisted, white enlisted, temporary duty personnel, officer, and the totals. It should be noted that the totals on this chart differ from appendix IX since the latter also includes Depot families, marines, and contractor personnel.

Contract No. NOY	Description	Contractor	Amount	Date of Completion
4809	Original Depot	Myer Bros & Haddock, Ltd	* \$1,800,000.00	1 July 1945
5468	Additions to and completion of 4809	Myer Bros & Haddock, Ltd	368,284.00	
6193	Additional Magazines	Haddock	198,960.65	7 Feb 1944
6389	Recreation Building	P. J. Walker Co.	83,081.52	9 Jun 1944
6926	Repair of Storm Damage, Erosion Control and Drainage	Frank Hickey, Inc.	103,821.49	12 Feb 1944
7190	Transfer Depot Addition	M & H Golden Constr. Co.	104,532.61	26 Jun 1944
7431	Barracks, B.O.Q. and Scullery and Reconstruction (RR)**	Haddock	118,733.73	24 May 1944
8471	Swimming Pool, Athletic Field	Paddock	64,957.88	23 Oct 1944
8525	Sewerage and Disposal Plant	J. S. Barrett	168,125.83	15 Mar 1945
9318	Mark VIII Depth Bomb Testing Building	Paddock	155,655.15	30 Sep 1944
9640	Maintenance Warehouse, Service Building, Incinerator	Haddock	73,921.78	15 Jul 1945
9670	Additional Magazines	Shannahan	1,210,475.62	1 Jul 1945
9691.	Extension of RR Sidings	Haddock	27,360.26	17 Sep 1944
10137	Marine Barracks	Haddock	29,409.95	18 Dec 1944
11877	Fire Mains Extension	J.S.Barrett	57,488.69	

* Cost figures for NOY 4809 are not available but the original allotment was \$1,800,000.00

** Portion of track built as 5468.

Dept
Police
Area

1945 MAP =

7/20/45



Appendix C: Project Source Data – Site Specific

Interview Record

Installation/Range or Site:

NAVWPNSTA Seal Beach, Detachment Fallbrook, California

Date/Time: September 29, 2004

Person Conducting the Interview/Title/Organization:

Monique De Jesus/Project Engineer/Malcolm Pirnie

Person Being Interviewed/Title/Organization:

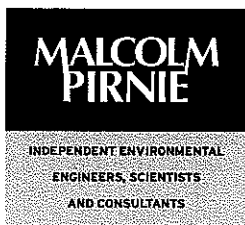
Master Gunnery Sergeant Samuel Larter/EOD Detachment at MCB Camp Pendleton

Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.):

His team responds to munitions incidents at Detachment Fallbrook

Interview Notes (i.e., Range History, Ordnance Types, Land Use, Historical Records/Maps Available):

Master Gunnery Sergeant Samuel Larter allowed the team access to any responses his team had performed at Detachment Fallbrook.



Interview Record

Installation/Range or Site:

NAVWPNSTA Seal Beach, Detachment Fallbrook, California

Date/Time: September 29, 2004

Person Conducting the Interview/Title/Organization:

Monique De Jesus/Project Engineer/Malcolm Pirnie

Person Being Interviewed/Title/Organization:

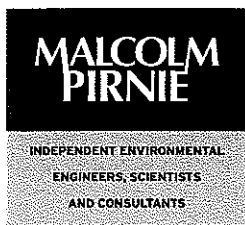
Greg Town/Quality Assurance/Ordnance Department

Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.):

His knowledge from working at the Ordnance Department

Interview Notes (i.e., Range History, Ordnance Types, Land Use, Historical Records/Maps Available):

Mr Town was familiar with the location of the Salvage Yard Landfill, the five Dunnage Disposal Sites, and the QE Test Area. He gave us information on these sites like years of use, plus he gave us other names of personnel to interview. He had heard that munitions may have been dumped in the lakes and in the ravines throughout Detachment Fallbrook.



Interview Record

Installation/Range or Site:

NAVWPNSTA Seal Beach, Detachment Fallbrook, California

Date/Time: September 29, 2004

Person Conducting the Interview/Title/Organization:

Monique De Jesus/Project Engineer/Malcolm Pirnie

Person Being Interviewed/Title/Organization:

Kevin Bourelle/Head of the Facilities Department

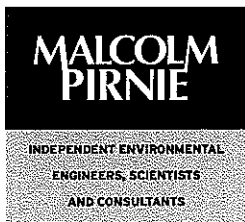
Richard Spinello/Maintenance Supervisor/Facilities Department

Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.):

Their knowledge of Detachment Fallbrook and its facilities.

Interview Notes (i.e., Range History, Ordnance Types, Land Use, Historical Records/Maps Available):

Mr. Bourelle and Mr Spinello helped the team with the delineation of boundaries for the sites and years of use. They also gave the team access to the map and photograph archives for Detachment Fallbrook



Interview Record

Installation/Range or Site:

NAVWPNSTA Seal Beach, Detachment Fallbrook, California

Date/Time: September 29, 2004

Person Conducting the Interview/Title/Organization:

Monique De Jesus/Project Engineer/Malcolm Pirnie

Person Being Interviewed/Title/Organization:

Ken Scofield/Security Department

Leslie Hawkins/Physical Security Specialist/Security Department

Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.):

They had worked at the Security Forces (SF) Small Arms Range.

Interview Notes (i.e., Range History, Ordnance Types, Land Use, Historical Records/Maps Available):

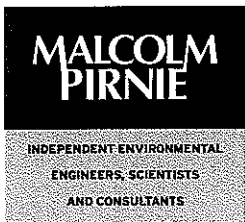
Both Mr. Scofield and Ms. Hawkins gave us information on the SF Small Arms Range:

-when it was used (by Marine SF from 1945 to 1988 and by civilian SF from 1987 to 1991); it was used for handgun marksmanship training and by station civilians and local law enforcement officers

-what munitions were used there (.38 cal, 45 cal, and 9-mm); the weapons were fired at targets set up in front of a natural berm

-it was closed due to its proximity to the main administration areas at Detachment Fallbrook and to the town of Fallbrook

-the possibility that before 1953, the Marine SF might have dumped unexpended shells into Depot and/or Lower Lake instead of turning them into inventory.



Interview Record

Installation/Range or Site:

NAVWPNSTA Seal Beach, Detachment Fallbrook, California

Date/Time: September 29, 2004

Person Conducting the Interview/Title/Organization:

Monique De Jesus/Project Engineer/Malcolm Pirnie

Person Being Interviewed/Title/Organization:

Members from the Marine Corps Program Division (MCPD)

Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.):

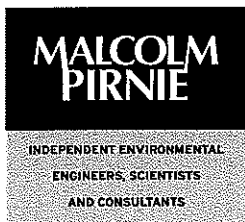
They were part of the group that had worked on the QE Test Area

Interview Notes (i.e., Range History, Ordnance Types, Land Use, Historical Records/Maps Available):

The members interviewed were: Wayne Ventuleth (head of the MCPD), Daniel Reagle (Supervising Engineer Technician), John Korchick (Mechanical Engineer), and Jim Francis (Mechanical Engineer).

They told us how long the TA had been in use as a test area (from 1977 to 1989), what was used on it (rifle grenades, rockets, 75-mm shells, and 60- and 81-mm mortars), and that most of the munitions were picked up after every test. They used it as a test area because it was already being used for OB/OD purposes and other munitions uses.

They also gave us access to their personal archives about the site and activities carried out there.



Interview Record

Installation/Range or Site:

NAVWPNSTA Seal Beach, Detachment Fallbrook, California

Date/Time: September 28, 2004

Person Conducting the Interview/Title/Organization:

Monique De Jesus/Project Engineer/Malcolm Pirnie

Person Being Interviewed/Title/Organization:

Kenneth A Kaptain/Member of the MCB Camp Pendleton Fire Department/760-725-3959

Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.):

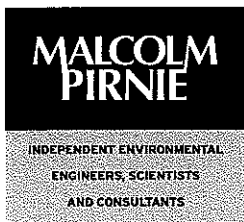
He worked at Detachment Fallbrook with the Marine Corps Security from 1973 to 1976, and has been working at the installation with the fire department since 1979.

Interview Notes (i.e., Range History, Ordnance Types, Land Use, Historical Records/Maps Available):

Ms. Kaptain gave us the following data:

- He knew about the SF Small Arms Range, the weapons they used on it (.38 cal, 45 cal, and 9-mm), and dates of use (by the Marines SF from 1945 to 1988 and by the civilian SF from 1987 to 1991).

-He was very familiar with the Skeet/Trap Range (he had used it himself): it was a recreational range used mostly by the Marine SF, but also by other station personnel from 1950 to 1987. Munitions on the range were limited to 12-gauge shotguns. The range was oriented to the west.



Interview Record

Installation/Range or Site:

NAVWPNSTA Seal Beach, Detachment Fallbrook, California

Date/Time: September 29, 2004

Person Conducting the Interview/Title/Organization:

Monique De Jesus/Project Engineer/Malcolm Pirnie

Person Being Interviewed/Title/Organization:

Lisa Bosalet/Cultural Resources Manager/562-626-7637

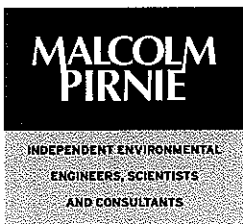
Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.):

Her knowledge of cultural resources at Detachment Fallbrook

Interview Notes (i.e., Range History, Ordnance Types, Land Use, Historical Records/Maps Available):

Ms. Bosalet gave us the following data:

- she gave us access to the cultural resources inventory, although most of the information in it was too sensitive for inclusion in the PA;
- she helped us determine which of our eleven sites had cultural resources on them or near them that any future investigations would have to be watchful of



Interview Record

Installation/Range or Site:

NAVWPNSTA Seal Beach, Detachment Fallbrook, California

Date/Time: September 28, 2004

Person Conducting the Interview/Title/Organization:

Monique De Jesus/Project Engineer/Malcolm Pirnie

Person Being Interviewed/Title/Organization:

Robbie Knight/Natural Resources Manager/760-731-3425

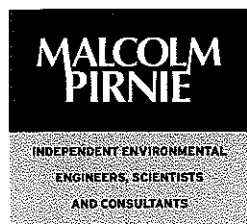
Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.):

His position at the installation

Interview Notes (i.e., Range History, Ordnance Types, Land Use, Historical Records/Maps Available):

Mr Knight gave us the following data:

- contact information for other people to interview, and helped us arrange the interviews;
- access to the archives vault at the Environmental Department, where we found a lot of records and photographs describing munitions use and disposal at Detachment Fallbrook;
- took us on the initial tours of the sites; and
- detailed information on the natural resources at Detachment Fallbrook, including soils, vegetation, ecological receptors, hydrology, and hydrogeology.



Interview Record

Installation/Range or Site:

NAVWPNSTA Seal Beach, Detachment Fallbrook, California

Date/Time: March 8, 2005

Person Conducting the Interview/Title/Organization:

Monique De Jesus/Project Engineer/Malcolm Pirnie

Person Being Interviewed/Title/Organization:

Don McNamara/Retired Personnel/760-728-4037

Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.):

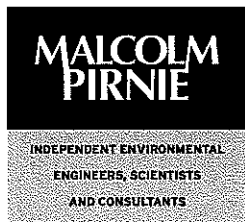
He was a Special Weapons Officer from 1974 to 1976.

Interview Notes (i.e., Range History, Ordnance Types, Land Use, Historical Records/Maps Available):

Mr McNamara gave us the following data:

-he closed out the nuclear weapons area

-there were not a lot of disposal activities during his time on the base; it was a stand down period.



Interview Record

Installation/Range or Site:

NAVWPNSTA Seal Beach, Detachment Fallbrook, California

Date/Time: March 8, 2005

Person Conducting the Interview/Title/Organization:

Monique De Jesus/Project Engineer/Malcolm Pirnie

Person Being Interviewed/Title/Organization:

Bill Houlder/Retired Personnel/760-723-8469

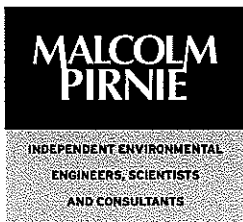
Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.):

He was the former Facilities Officer from 1973 to 1976

Interview Notes (i.e., Range History, Ordnance Types, Land Use, Historical Records/Maps Available):

Mr Houlder gave us the following data:

- he was not aware of any fuel trenches at the QE Test Area or near it.
- he was not aware of any dumping of munitions; the lakes always had water in them according to him
- the biggest problem during his time was what to do with the Napalm on base.
- he thinks most of the dumping happened when the WWII stuff came back to the continental U S from overseas



Interview Record

Installation/Range or Site:

NAVWPNSTA Seal Beach, Detachment Fallbrook, California

Date/Time: March 8, 2005

Person Conducting the Interview/Title/Organization:

Monique De Jesus/Project Engineer/Malcolm Pirnie

Person Being Interviewed/Title/Organization:

Commander James H. Owens/Retired Personnel/520-818-0520

Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.):

He was formerly in charge of Detachment Fallbrook from 1962 to 1965.

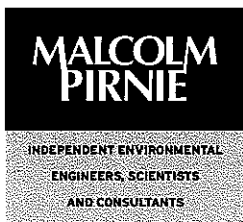
Interview Notes (i.e., Range History, Ordnance Types, Land Use, Historical Records/Maps Available):

Commander Owens gave us the following data:

-according to him, everything relating to munitions testing, disposal, and burning was done in and around the QE Test Area. Most of this work was carried out by the Ordnance Department, at least three times while he was there.

-he did not know of a pistol or skeet range on base.

-he did not know about any dumping of munitions in the lakes. The lakes were very shallow while he was there.



Interview Record

Installation/Range or Site:

NAVWPNSTA Seal Beach, Detachment Fallbrook, California

Date/Time: March 8, 2005

Person Conducting the Interview/Title/Organization:

Monique De Jesus/Project Engineer/Malcolm Pirnie

Person Being Interviewed/Title/Organization:

Buddy Ingram/Retired Personnel/760-758-7276

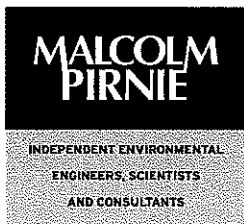
Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.):

He was a former Technician with the Ordnance Department, and subsequently the Head of the Security Department from 1978 to 1994.

Interview Notes (i.e., Range History, Ordnance Types, Land Use, Historical Records/Maps Available):

Mr. Ingram gave us the following data:

- he worked in Building 366, which was the missile building back then
- he worked at Detachment Fallbrook from 1978 to 1994.
- he had three brothers that also worked at Detachment Fallbrook:
 - Paul Ingram (former Public Works Officer), deceased
 - Walter Ingram (worked in Ordnance and Airlaunch division), still alive.
 - Bill Ingram, deceased



Interview Record

Installation/Range or Site:

NAVWPNSTA Seal Beach, Detachment Fallbrook, California

Date/Time: March 8, 2005

Person Conducting the Interview/Title/Organization:

Monique De Jesus/Project Engineer/Malcolm Pirnie

Person Being Interviewed/Title/Organization:

Commander Reginald Fogg /Retired Personnel/760-728-9157

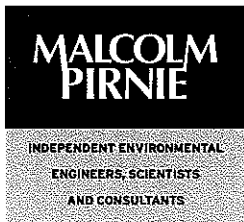
Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.):

He was formerly in charge of Detachment Fallbrook from 1965 to 1970

Interview Notes (i.e., Range History, Ordnance Types, Land Use, Historical Records/Maps Available):

Commander Fogg gave us the following data:

- he oversaw the destruction of munitions at the burn areas.
- he thought we should try the Fallbrook Historical Society records.



Interview Record

Installation/Range or Site:

NAVWPNSTA Seal Beach, Detachment Fallbrook, California

Date/Time: March 8, 2005

Person Conducting the Interview/Title/Organization:

Monique De Jesus/Project Engineer/Malcolm Pirnie

Person Being Interviewed/Title/Organization:

LCDR Thom Curtis/Retired Personnel/760-728-2945

Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.):

He was the Assistant Commanding Officer at Detachment Fallbrook from 1974 to 1977 and the Commanding Officer from 1977 to 1980

Interview Notes (i.e., Range History, Ordnance Types, Land Use, Historical Records/Maps Available):

LCDR Curtis gave us the following data:

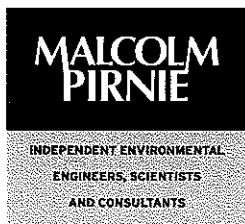
-Depot Lake used to flow into another lake

-Stuff was buried in the ravines by Bldg 307; supposedly munitions and munitions scrap returned from the Korean War.

-Bldg 338: maybe a torpedo testing site built into the hill near Site 34D.

-Bldg 365: a re-inforced building that was probably used for testing

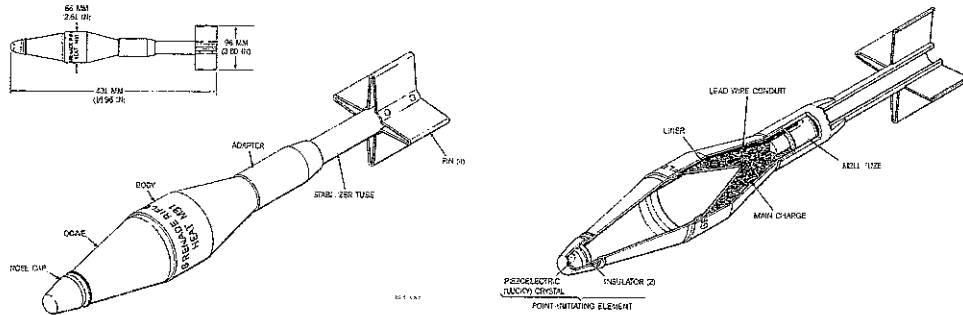
-Tony Perez was the bulldozer operator that helped bury the munitions and munitions scrap in the Ravines (lives in Escondido?)



Appendix D: Ordnance Technical Data Sheets

Ordinance Technical Data Sheet

U.S. GRENADE, RIFLE, HEAT, M31



Nomenclature:	U.S. Grenade, Rifle, Heat, M31
Ordinance Family:	Grenades
DODIC:	Not provided
Filler:	Composition B
Filler weight:	280.67 g (9.9 oz)
Item weight:	708.00 g (24.97 oz)
Propelling Charge:	Single or Double Base Powder
Diameter:	66.00 mm (2.598 in)
Length:	431.00 mm (16.97 in)
Maximum Range:	Not provided
Fuze:	Point-initiating base-detonating fuze, M211

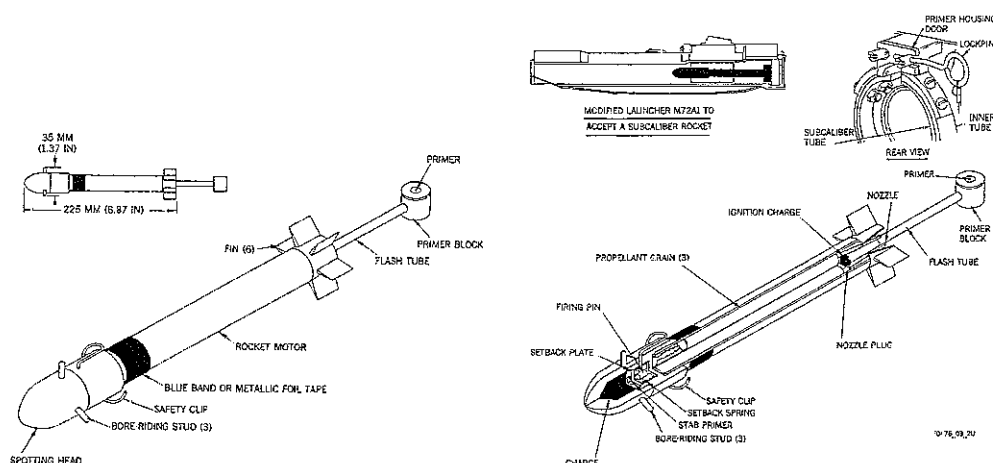
Usage: This is a fin-stabilized high-explosive antitank rifle grenade that has an integral setback-armed, point-initiating base-detonating fuze M211, which contains a piezoelectric crystal and an electric detonator.

Description: The grenade is painted olive drab and the markings are in yellow. The practice version is painted blue with white markings.

Reference: ORDATA Online

Ordnance Technical Data Sheet

U.S. ROCKET, 35-MM, SUBCALIBER, PRACTICE, M73



Nomenclature:	U S. Rocket, 35-MM, Sub caliber, Practice, M73
Ordnance Family:	Rocket
DODIC:	Not Provided
Filler:	Propellant, Rocket, Double-Base
Filler weight:	10.00 g (.3527 oz)
Item weight:	145.00 g (5.115 oz)
Diameter:	35.00 mm (1.3878 in)
Length:	225.00 mm (8.858 in)
Maximum Range:	220 m (240.6 yds)
Fuze:	Impact-inertia fuze

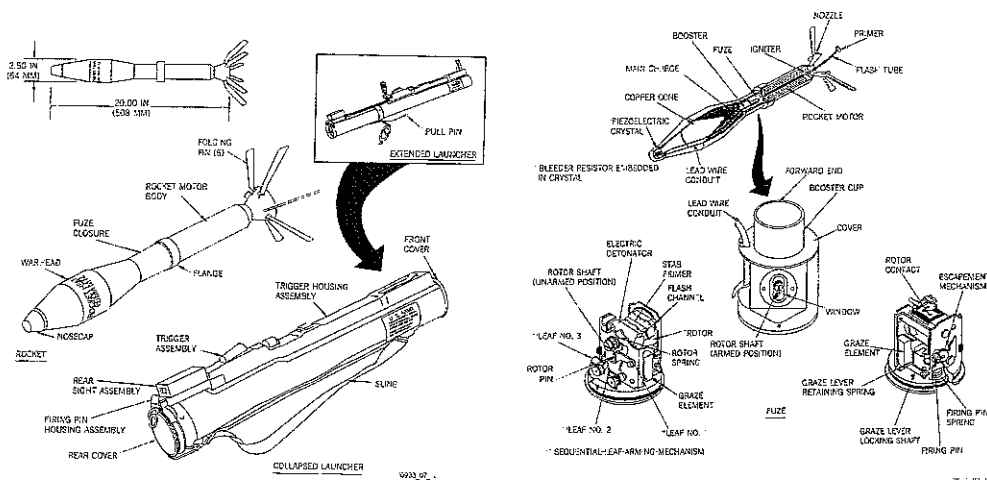
Usage: This is a sub-caliber practice rocket incorporating an integral, impact-inertia fuze. It is used for training and simulates the rocket for the light antitank weapon (LAW) system. The rocket is fired from a practice M190 launcher (a modified M72A1 LAW launcher). The figure shows the appearance and dimensions of the M73 practice rocket and M190 launcher.

Description: The spotting head and fins are painted black; the remainder of the rocket is olive drab. A blue band appears on the forward end of the rocket motor. On later production rockets, the spotting head is painted blue and the fins are painted brown. The rocket motor section is olive drab with white markings. A metallic foil covered tape is attached around the forward end of the rocket motor for weight adjustment.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

U.S. ROCKET, 66-MM, LAW, M72, M72A1, M72A2, AND M72A3



Nomenclature:	66-MM, LAW, M72, M72A1, M72A2, AND M72A3
Ordnance Family:	Rockets
DODIC:	Not Provided
Filler:	Octol
Filler weight:	454.00 g (16.01 oz)
Item weight:	2.18 kg (4.8 lbs)
Diameter:	64.00 mm (2.52 in)
Length:	508.00 mm (20 in)
Maximum Range:	Not Provided
Fuze:	M412 PIBD or M412A1

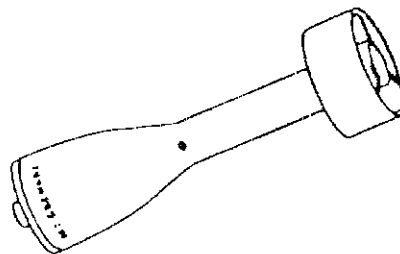
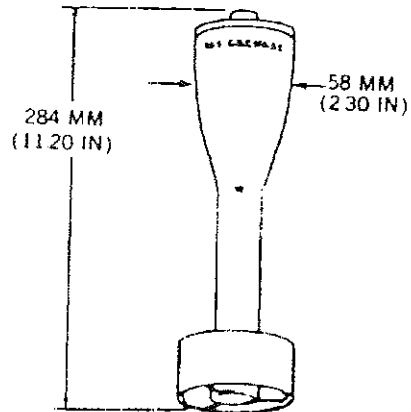
Usage: These are shoulder-fired, fin-stabilized, high-explosive light antitank weapons used primarily to penetrate armored targets. The rockets use an M54 rocket motor. The M72 uses an M18 warhead and an M412 point-initiating base-detonating (PIBD) fuze. The M72A1 uses an M18A1 warhead and an M412 PIBD fuze. The M72A2 and M72A3 use an M18A1 warhead and an M412A1 PIBD fuze.

Description: The rocket launcher is painted olive drab with instruction labels on olive drab backgrounds with white printing. The manufacturing information is printed in white. Those launchers with limited light sights have a decal stating such and front sights coated with a yellow- or white-colored radioactive material at the 100- and 150-meter range markings with remaining markings in red. Front sights not coated for night use will have all range markings in red. The rocket motor is brown and the warhead is black with yellow markings.

Reference: ORDATA Online.

Ordinance Technical Data Sheet

U.S. GRENADE, RIFLE, M9



Nomenclature:	U.S. GRENADE, RIFLE, M9
Ordinance Family:	Grenades
DODIC:	
Filler:	TNT
Filler weight:	113.40 g (4 oz)
Item weight:	557.00 g (19.68 oz)
Diameter:	58.00 mm (2.283 in)
Length:	284.00 mm (11.18 in)
Maximum Range:	
Fuze:	Point-detonating fuze

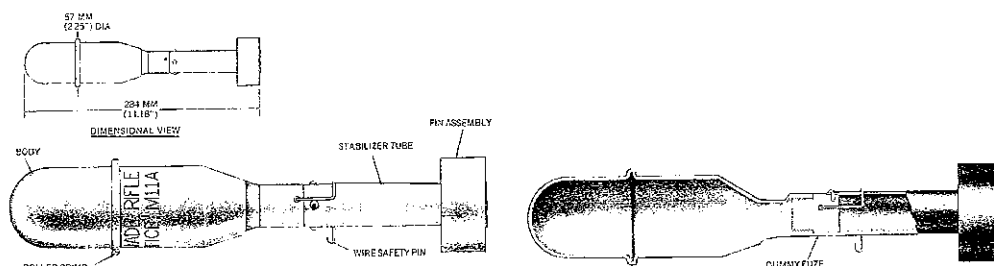
Usage: The figure shows the appearance and dimensions of the M9 grenade. The M9 is an earlier model of the M9A1. It has the same tail assembly, but the head is acorn-shaped and is equipped with a point detonating fuze. It is slightly less sensitive than the M9A1. The safety pin of the M9 is located in the base of the grenade body instead of in the stabilizer tube. Its pull ring is secured to the body with adhesive tape. It has a shrouded fin assembly which aids in stabilization.

Description: The grenade is painted olive drab in color.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

U.S. GRENADE, PRACTICE, INERT, M11 SERIES



Nomenclature:	U.S. GRENADE, PRACTICE, INERT, M11 SERIES
Ordnance Family:	Grenades
DODIC:	Not provided
Filler:	None
Filler weight:	N/A
Item weight:	558.00 g (19.68 oz)
Propelling Charge:	Single or Double Base Powder
Diameter:	57.00 mm (2.244 in)
Length:	284.00 mm (11.18 in)
Maximum Range:	Not provided
Fuze:	Impact inertia, base detonating fuze

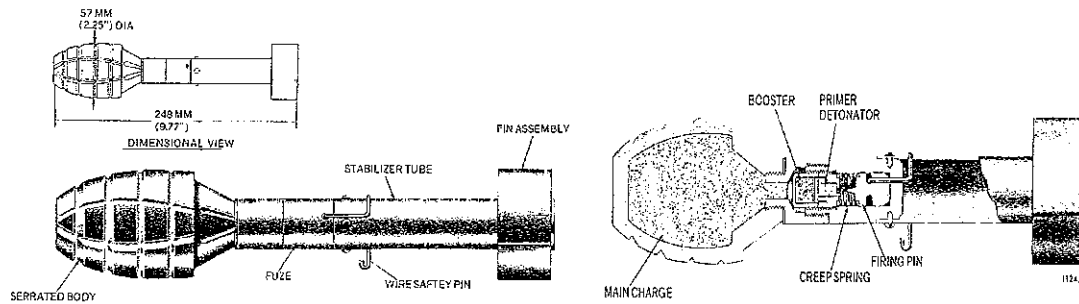
Usage: These are rifle-projected grenades that, except for the M11 series, contain a simple impact inertia, base detonating fuze. The M11 series practice grenades contain a dummy fuze that only has a safety pin hole.

Description: The painting and markings for each grenade are blue or black with white markings.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

U.S. GRENADE, RIFLE, FRAGMENTATION, M17



Nomenclature:	U.S. GRENADE, RIFLE, FRAGMENTATION, M17
Ordnance Family:	Grenades
DODIC:	
Filler:	Flaked TNT
Filler weight:	22.00 g (.776 oz)
Item weight:	667.00 g (23.53 oz)
Diameter:	57.00 mm (2.244 in)
Length:	248.00 mm (9.764 in)
Maximum Range:	
Fuze:	Impact inertia, base detonating fuze

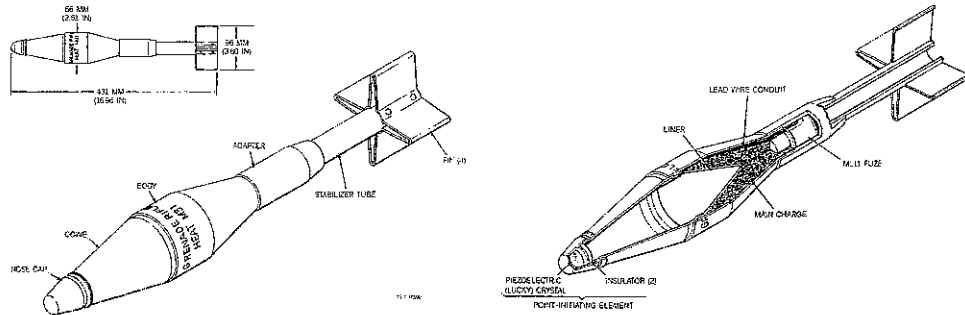
Usage: These are rifle-projected grenades that contain a simple impact inertia, base detonating fuze

Description: The painting and markings for each grenade are Olive Drab with yellow markings

Reference: ORDATA Online.

Ordinance Technical Data Sheet

U.S. GRENADE, RIFLE, HEAT, M31



Nomenclature:	U.S. Grenade, Rifle, Heat, M31
Ordinance Family:	Grenades
DODIC:	Not provided
Filler:	Composition B
Filler weight:	280.67 g (9.9 oz)
Item weight:	708.00 g (24.97 oz)
Propelling Charge:	Single or Double Base Powder
Diameter:	66.00 mm (2.598 in)
Length:	431.00 mm (16.97 in)
Maximum Range:	Not provided
Fuze:	Point-initiating base-detonating fuze, M211

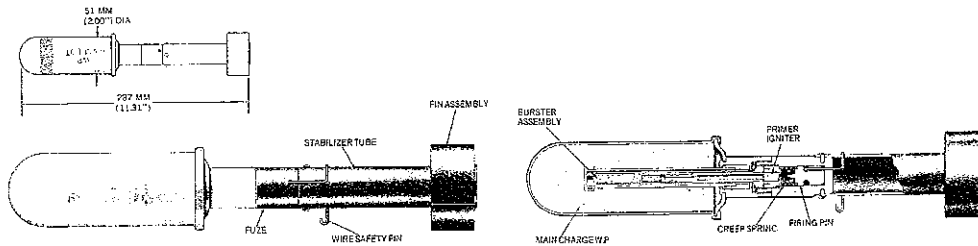
Usage: This is a fin-stabilized high-explosive antitank rifle grenade that has an integral setback-armed, point-initiating base-detonating fuze M211, which contains a piezoelectric crystal and an electric detonator.

Description: The grenade is painted olive drab and the markings are in yellow. The practice version is painted blue with white markings

Reference: ORDATA Online.

Ordinance Technical Data Sheet

U.S. GRENADE, RIFLE, SMOKE, HC, M20



Nomenclature:	U.S. GRENADE, RIFLE, SMOKE, HC, M20
Ordinance Family:	Grenades
DODIC:	Not provided
Filler:	Smoke Mix, HC
Filler weight:	306.00 g (10.79 oz)
Item weight:	712.00 g (25.12 oz)
Propelling Charge:	Single or Double Base Powder
Diameter:	51.00 mm (2.008 in)
Length:	287.00 mm (4.3 in)
Maximum Range:	Not provided
Fuze:	Impact inertia, base detonating fuze

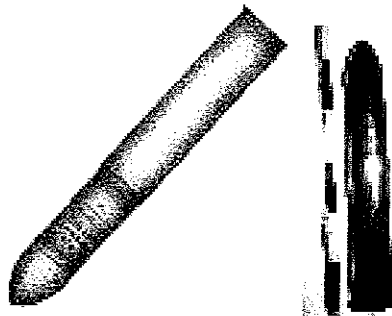
Usage: These are rifle-projected grenades that, except for the M11 series, contains a simple impact inertia, base detonating fuze

Description: The painting and markings for each grenade are either light gray or light green with yellow markings.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

U.S. PROJECTILE, 75-MM, AP, M72



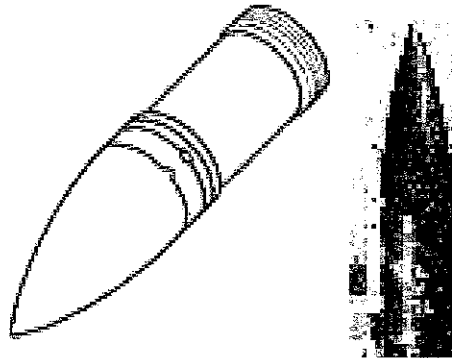
Nomenclature:	U S. Projectile, 75 MM, AP, M72
Ordnance Family:	Projectile
DODIC:	Not Provided
Filler:	Solid Shot
Filler weight:	Not Provided
Item Weight:	6.32 kg (13.93 lbs)
Diameter:	75.00 mm (2.953 in)
Length:	239.92 mm (9.446 in)
Maximum Range:	Not Provided
Fuze:	None

Usage: Armor-piercing which contain only a small percentage of their weight as high explosive or none, in which case they are known as shot. Projectiles depend on their material of construction or the face-hardening treatment gives the armor-piercing cap, which may be used, for their penetrating quality. This projectile is a solid shot.

Description: Projectile painted black except rotating band. Stenciled in white: "75 G, Shot A.P. M72, with Tracer".

Reference: ORDATA Online.

Ordnance Technical Data Sheet
**U.S. PROJECTILE, 75-MM, APC & APC-T,
M61A1**



Nomenclature:	U.S. Projectile, 75 mm, APC & APC-T, M61A1
Ordnance Family:	Projectile
DODIC:	Not Provided
Filler:	Explosive D
Filler weight:	Not Provided
Item Weight:	Not Provided
Diameter:	75.00 mm (2.953 in)
Length:	279.40 mm (11 in)
Maximum Range:	Not Provided
Fuze:	BD (Base Detonating Fuze)

Usage: This is an Army gun fired armor piercing capped projectile. APC-T (Army) and AP (Navy). These projectiles have a hardened AP cap over the nose of the body to which the windshield is secured. The AP cap increases the penetration ability of the projectile. Most APC-T projectiles, and all Navy AP projectiles 3 inches and larger, incorporate a small HE main charge in the base with a BD fuze which detonates after the projectile penetrates a target.

Description: Projectile is painted black with white lettering.

Reference: ORDATA Online

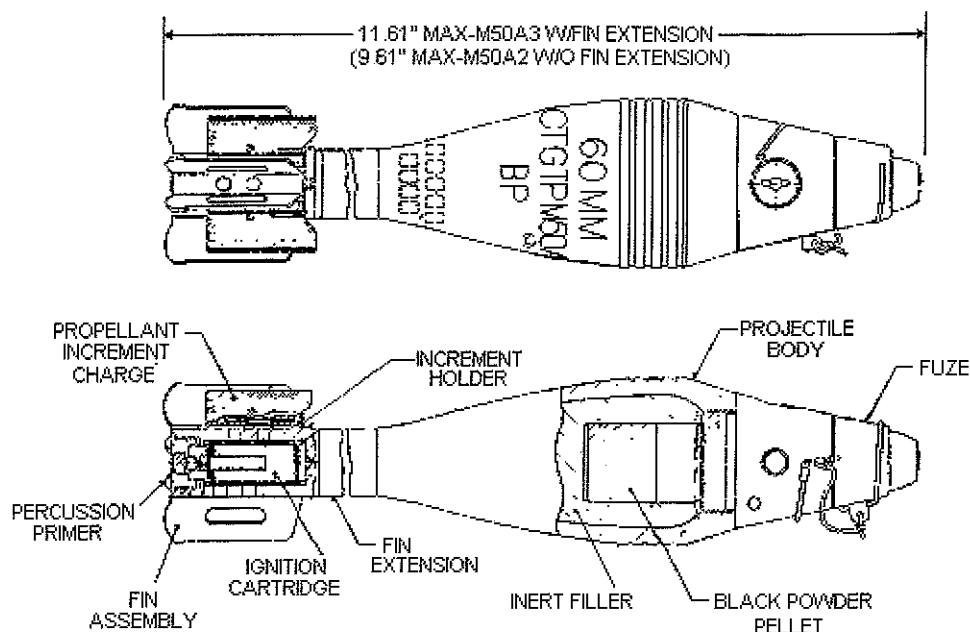
A detailed technical drawing of a water sprayer assembly, showing a side view of the nozzle and a top-down view of the handle. The drawing includes the following labels:

- WATER SPRAYER NO. 1
- WATER SPRAYER NO. 2
- WATER SPRAYER NO. 3
- WATER SPRAYER NO. 4
- WATER SPRAYER NO. 5
- WATER SPRAYER NO. 6
- WATER SPRAYER NO. 7
- WATER SPRAYER NO. 8
- WATER SPRAYER NO. 9
- WATER SPRAYER NO. 10
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- WATER SPRAYER NO. 95
- WATER SPRAYER NO. 96
- WATER SPRAYER NO. 97
- WATER SPRAYER NO. 98
- WATER SPRAYER NO. 99
- WATER SPRAYER NO. 100

Reference: ORDATA Online

Ordnance Technical Data Sheet

CARTRIDGE, 60MM TP, M50 SERIES



NOTE: FIN EXTENSION NOT INCLUDED ON THE M50A2

Nomenclature:	U.S. 60MM Mortar M50 Series (Practice)
Ordnance Family:	Projectile
DODIC:	B634
Filler:	Black Powder Pellet
Filler weight:	\pm 226.8 g (.5 lbs)
Item weight:	1.33 kg (2.94 lbs)
Diameter:	60 mm (2.362in.)
Length:	294.9mm (11.61in)
Range:	1815.00 m (1985 yds)
Fuze:	M935 Point Detonating Fuze or M734 Multi-Option Fuze

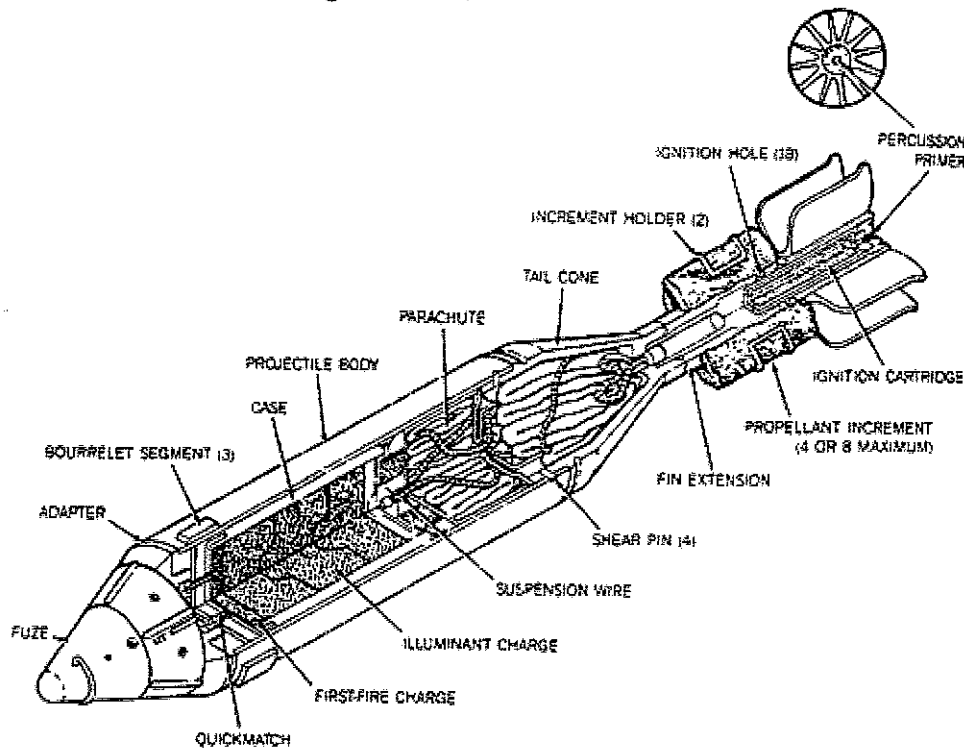
Usage: Light support weapon. Provided capability for High Explosive, Screening Smoke, and Illumination rounds delivered out to a maximum range of 1815 m (1985 yards).

Description: The cartridge is painted Olive Drab, except for the fin assembly which is unpainted aluminum. Nomenclature and manufacturing data are stenciled in black.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

U.S. Projectile, 81 MM Mortar



Nomenclature:	U.S. Projectile, 81 mm (3.18in) Mortar
Ordnance Family:	Projectile
DODIC:	C225
Filler:	Round dependent
Filler weight:	± 645.00 g (22.75 oz)
Item weight:	3.4 kg (7.5 lbs)
Diameter:	81 mm (3.189 in)
Length:	571.00mm (22.48 in)
Maximum Range:	2400 m (2625 yards)
Fuze:	M935 Point Detonating Fuze or M734/734A1 Multi-Option Fuze

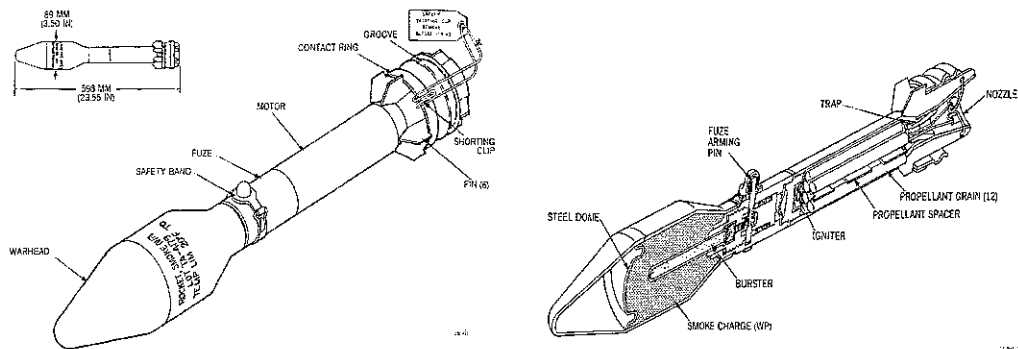
Usage: Light Support Weapon. Provides infantry units with the capability of light artillery in the form of , High Explosive, Screening Smoke, and Illumination rounds deliverable out to a maximum range of 2400 meters (2625 yards).

Description: The projectiles are painted white with stenciled black identification markings on the projectile bodies. Projectiles also may be gray with a white band and white markings

Reference: ORDATA Online.

Ordinance Technical Data Sheet

U.S. ROCKET, 3.5-INCH, SMOKE (WP), M30 (T127E3) & (T127E2)



Nomenclature:	3.5-inch, Smoke (WP), M30, (T127E3) & (T127E2)
Ordinance Family:	Rockets
DODIC:	Not Provided
Filler:	RDX
Filler weight:	1.10 kg (2.425 lbs)
Item weight:	4.10 kg (9.039 lbs)
Diameter:	98.00 mm (3.5 in)
Length:	589.00 mm (23.19 in)
Maximum Range:	Not Provided
Fuze:	Impact, base detonating fuze

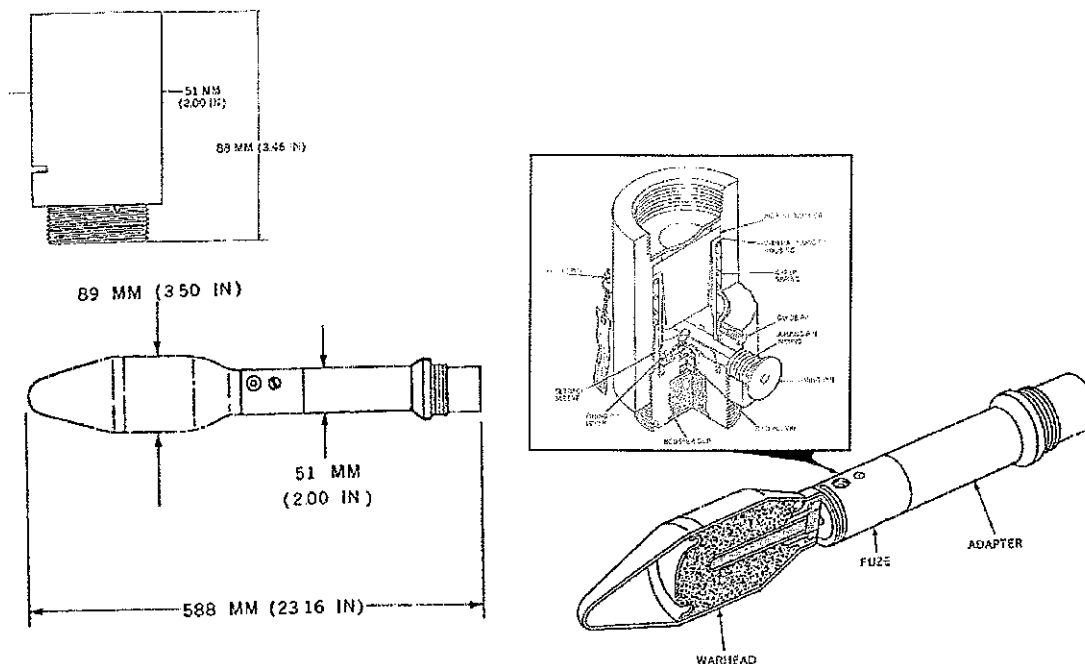
Usage: These are 3.5-inch, ground-fired, fixed-fin, smoke (white phosphorus) rockets.

Description: The warheads are light green with light red markings and a light red band. Older warheads are painted gray with yellow markings. The rocket motor is brown or olive drab. The fuzes are painted olive drab or black, and have the designation and loading information stamped in the body.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

U.S. ROCKET WARHEAD, 3.5-INCH



Nomenclature:	U.S. Rocket Warhead, 3.5-inch Smoke, WP, Aircraft
Ordnance Family:	Rockets
DODIC:	Not Provided
Filler:	RDX
Filler weight:	1.00 kg (2.2 lbs)
Item weight:	4.90 kg (10.8 lbs)
Diameter:	89.00 mm (3.5 in)
Length:	588.00 mm (23.15 in)
Maximum Range:	Not Provided
Fuze:	M404A1 base detonating (BD)

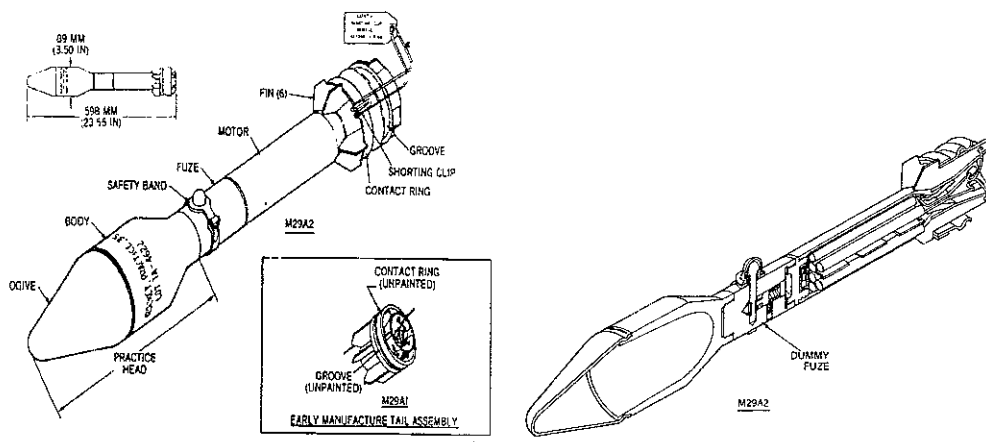
Usage: The figures show the appearance, dimensions, and general arrangement of the 3.5 inch warhead. This is a 3.5-inch phosphorus (WP) rocket warhead. It uses the M404A1 (modified) fuze which is a direct-arming, base-detonating (BD), non-delay fuze. The warhead and fuze are coupled to a 2.75-inch rocket motor by an adapter and are used against aircraft.

Description: The fuze is painted olive drab or black, and has the designation and loading information stamped in the body. Older warheads are painted gray with yellow markings.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

U.S. ROCKET, 3.5-INCH, PRACTICE, M29, M29A1, & M29A2



Nomenclature:	3.5-INCH, PRACTICE, M29, M29A1, & M29A2
Ordnance Family:	Rockets
DODIC:	Not Provided
Filler:	None
Filler weight:	N/A
Item weight:	3.90 kg (8.6 lbs)
Diameter:	89.00 mm (3.5 in)
Length:	598.00 mm (23.54 in)
Maximum Range:	Not Provided
Fuze:	None

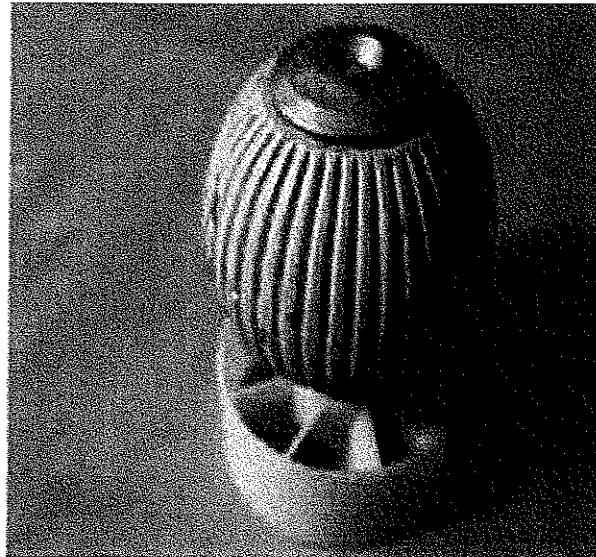
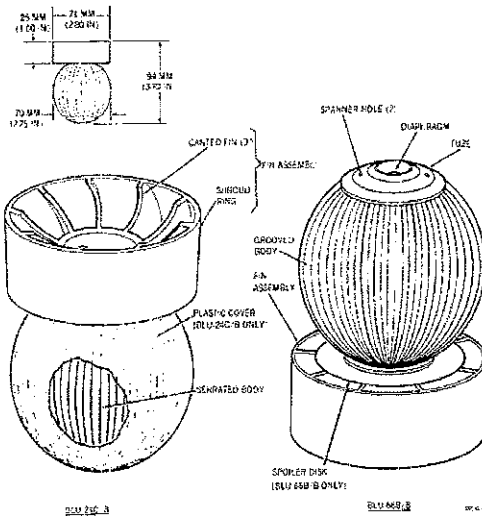
Usage: The M29-series rockets are inert and are used for training. The M29A2 rocket is modified for use in the M69 practice landmine system.

Description: The fuzes are painted olive drab or black, and have the designation and loading information stamped in the body. The M29 warhead and rocket motor are blue. The M29A1 and M29A2 warheads are blue, and the rocket motors are brown, or olive drab with brown bands. The M29-series practice heads have white markings. The contact ring and groove or notch on all the rockets are unpainted.

Reference: ORDATA Online.

Ordinance Technical Data Sheet

U.S. BOMB UNIT, FRAG, BLU-24C/B & BLU-66B/B (JUNGLE/ALL-TERRAIN BOMB)



Nomenclature:	BLU-24C/B & BLU-66 B/B
Ordinance Family:	Submunitions
DODIC:	Not Provided
Filler:	Cyclotol
Filler weight:	125.00 g (4.409 oz)
Item weight:	907.00 g (31.99 oz)
Diameter:	70.00 mm (2.576 in)
Length:	94.00 mm (3.701 in)
Maximum Range:	Not Provided
Fuze:	Spin-decay-fired

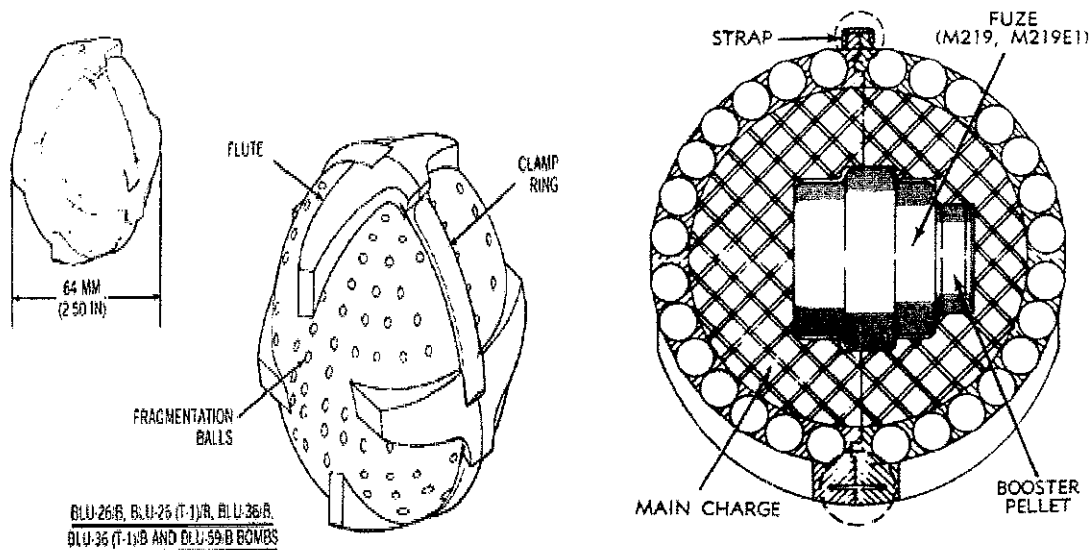
Usage: These are small, aerial dispensed, fin-stabilized, antipersonnel, anti-material, jungle penetrating fragmentation (frag) bombs. They are centrifugal armed (spin armed) and fired when centrifugal force decreases (spin-decay fired) or when the bomb impacts water or mud.

Description: The bomb body is yellow, with designation, lot number, and date of manufacture stenciled in black on the side of the body. The fuze on the front of the bomb is unpainted. The fin assembly is white.

Reference: ORDATA Online.

Ordinance Technical Data Sheet

U.S. BOMB UNIT, FRAG, BLU-26/B, BLU-36/B, BLU-59/B, & BLU-36(T-1)/B



Nomenclature:	BLU-26, 36, 59
Ordinance Family:	Submunitions
DODIC:	Not Provided
Filler:	Cyclotol
Filler weight:	85.00 g (2.998 oz)
Item weight:	454.00 g (16.01 oz)
Diameter:	64.00 mm (2.52 in)
Length:	19.51 mm (.7842 in)
Maximum Range:	N/A
Fuze:	Impact or Time delay fired

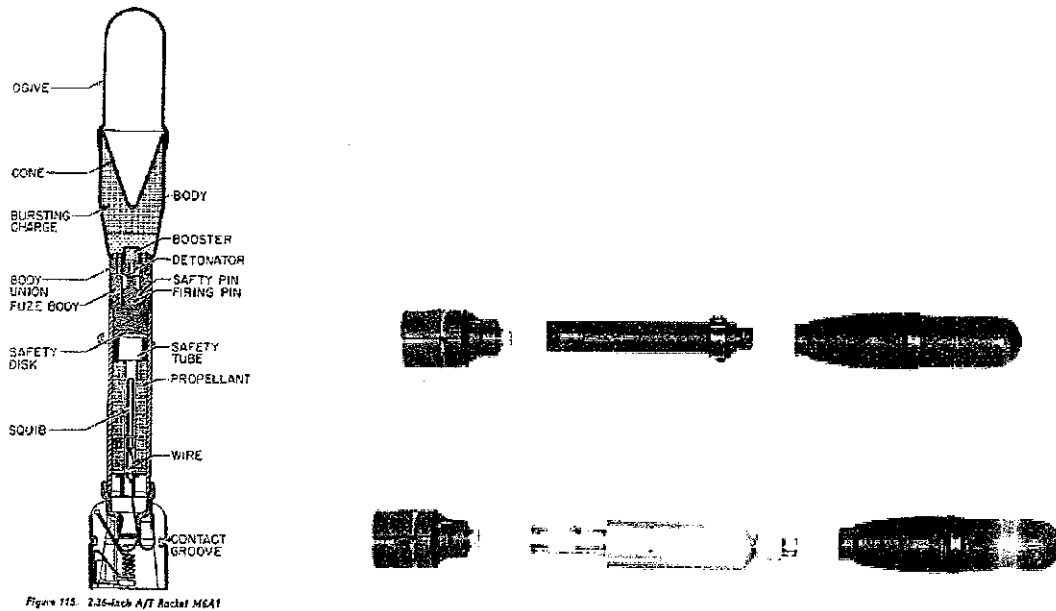
Usage: These are all small, aerial dispensed, centrifugal armed, high-explosive fragmentation bombs. The bombs all consist of two hemispheres held together by a crimp ring. The BLU-26/B bombs are impact-fired and the BLU-36/B and BLU-59/B bombs are time-delay-fired. The BLU-26(T-1)/B and BLU-36(T-1)/B are training versions of the BLU-26/B and BLU-36/B, respectively. These training bombs contain a live fuze but no main charge, and are used for fuze reliability testing and establishing delivery tactics. The outer wall has a weakened area which ruptures when the fuze functions.

Description: These bombs are olive drab with a small yellow dot on one hemisphere. Designation and loading data may be stenciled in yellow on all the bombs. The BLU-26(T-1)/B and BLU-36(T-1)/B are painted blue with white markings.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

U.S. Rocket, M6 Series, A1 thru A5, HEAT



Nomenclature:	U.S. Rocket, 2.36 in Heat, M6 Series
Ordnance Family:	Rockets
DODIC:	Obsolete
Filler:	Pentolite
Filler weight:	Not Provided
Item Weight:	(8.4 lbs)
Diameter:	60.00 mm (
Length:	546.00 mm (21.6 in)
Maximum Range:	(800 yds)
Fuze:	Impact

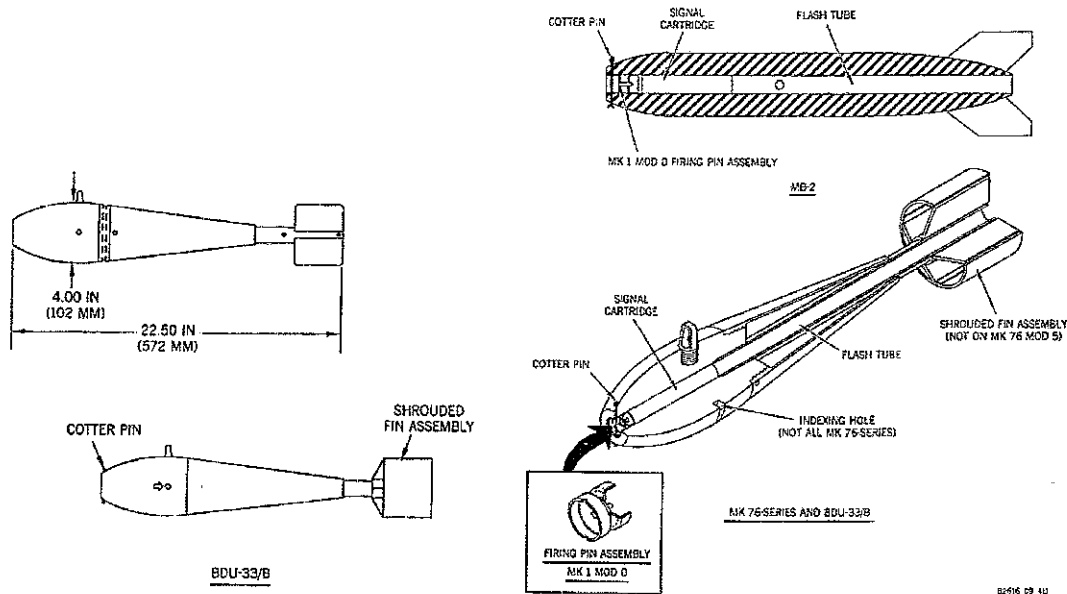
Usage: This is a fin stabilized high explosive antitank rocket. The figure shows the appearance and dimensions of the M6 series rocket. The M6A1 and M6A3 are identical except for difference in the ogive and the tail assembly.

Description: The rocket is painted olive drab. The M6A1 has six fins 5 1/2 inches long, and the M6A3 has four fins 2 5/16 inches long attached to a ring which provides a conical appearance.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

U.S. BOMB, 25-LB, PRACTICE, BDU-33/B, BDU-33A/B



Nomenclature:	BDU-33/B, BDU-33A/B
Ordnance Family:	Bomb
DODIC:	E963
Filler:	Signal Cartridge specific
Filler weight:	Not Provided
Item weight:	11.00 kg (24.25 lbs)
Diameter:	102.00 mm (4.016 in)
Length:	572.00 mm (24.69 in)
Maximum Range:	Not Provided
Fuze:	MK 4 series Signal Cartridge

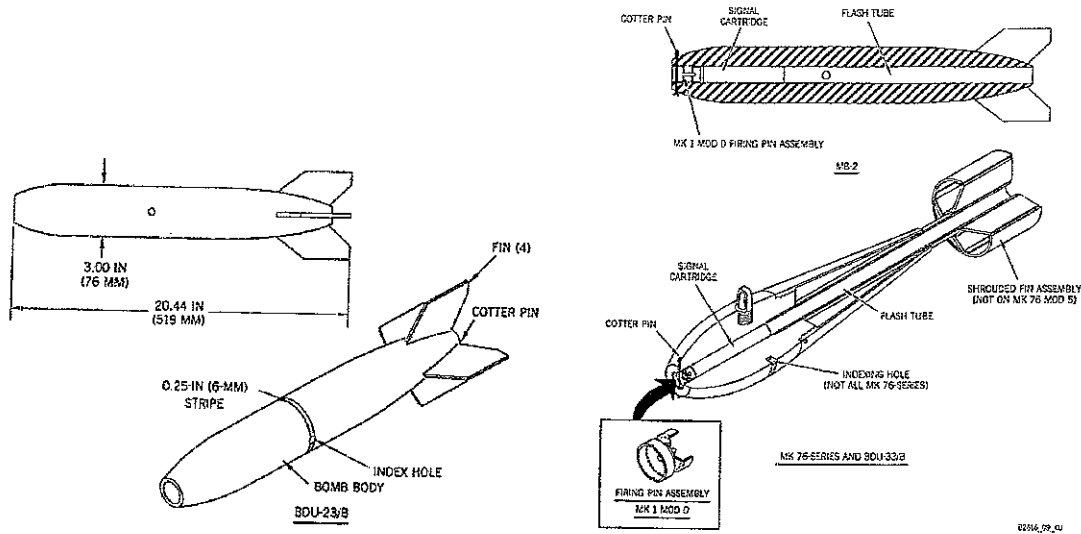
Usage: These bombs are signal-generating, impact-or impact-inertia-fired practice/simulated bombs.

Description: The BDU-33-series bombs are painted light blue; additionally, the BDU-33/B has white arrowheads and white stenciled markings. The BDU-33A/B, 33B/B, and 33D/B have white stenciled markings only.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

U.S. BOMB, 25-LB, PRACTICE, BDU-23/B



Nomenclature:	BDU-23/B Practice Bomb
Ordnance Family:	Bomb
DODIC:	E963
Filler:	Titanium Tetrachloride (Spotting Charge)
Filler weight:	Not provided
Item weight:	11.34 kg (25 lbs)
Diameter:	76.00 mm (2.992 in)
Length:	519.00 mm (20.43 in)
Maximum Range:	Not Provided
Fuze:	MK 4 series Signal Cartridge

Usage: These bombs are signal-generating; impact- or impact-inertia-fired practice/simulated bombs. These bombs use either the Mk 4-series, Mk 5 Mod 0, CXU-3/B, CXU-3A/B signal cartridge, or the CXU-2/B spotting charge.

Description: The BDU-23/B bomb is painted black with a 0.25-inch (6-millimeter) white stripe over the index holes and white stenciled markings.

Reference: ORDATA Online.

SUSPENSION LUG

BOMB BODY

COTTER PIN

INDEX HOLE

WHITE STRIPE

TAIL SECTION

TCU ASSEMBLY

NOTE: SOME EARLIER PRODUCTIONS OF THE MOD 0 HAVE INDEX HOLES AND A WHITE STRIPE AROUND THE BODY OVER THE INDEX HOLES. NOT ALL M16 TS BOMBS HAVE INDEX HOLES.

MOD 0

MOD 1 AND 3

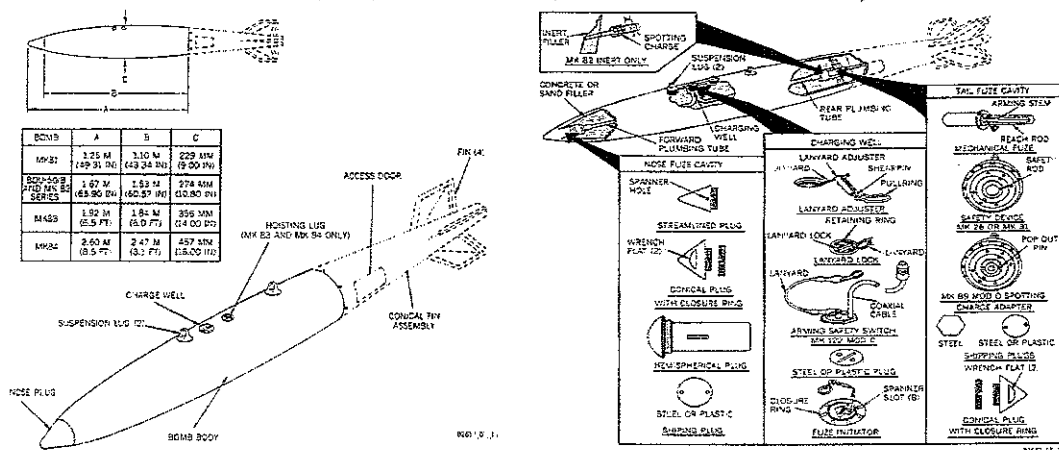
MOD 2

MOD 4



Ordinance Technical Data Sheet

U.S. BOMB, 2,000-LB, PRACTICE, MK 84



Nomenclature: MK 84 Practice 2,000lb
Ordinance Family: Bomb
DODIC: F267
Filler: N/A
Filler weight: N/A
Item weight: 907.00 kg (2000 lbs)
Diameter: 457.00 mm (17.99 in)
Length: 2.50 m (8.202 ft)
Maximum Range: Not Provided
Fuze: Mission Dependent

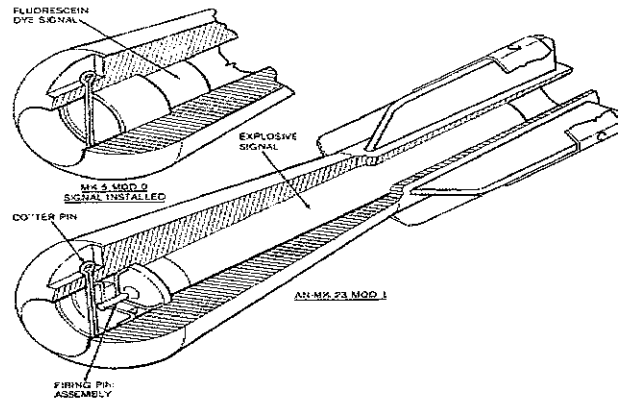
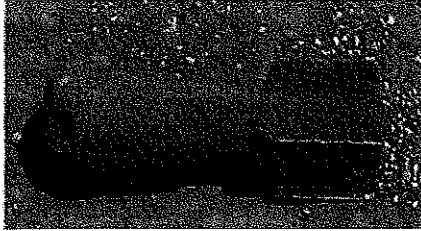
Usage: The Mk(s) 81 through 84 concrete or sand-filled practice bombs are used to train pilots in delivery techniques. These bombs normally do not contain explosive fillers or spotting charges. Explosive-loaded practice bombs have been found; therefore, all Mk 81 through Mk 84 concrete and sand-filled bombs should be treated as suspect. These bombs may contain live internal fuzes with boosters, live external fuzes and adapter-boosters, or a spotting charge adapter with a signal cartridge installed. They are all designed to function on impact, producing blast and fragmentation or a puff of white smoke.

Description: The Mk(s) 81 through Mk 84 concrete- or sand-filled bombs are painted blue or olive drab, with white or black markings. Bombs fitted with a signal charge will have a brown or yellow band no wider than 76 millimeters (3.00 inches) circumscribed near the nose of the bomb. However, explosive-loaded practice bombs may be found without markings or color band indicating the explosive content. Inert-loaded Mk 82 Mod 2 practice bombs may be found with an olive drab thermal coating and a 76-millimeter (3.00-inch)-wide blue nose band. Loading information is stenciled on the thermal coating. Thermally protected practice bombs are also die-stamped on the base plate to indicate their inert filler.

Reference: ORDATA Online, MIDIAS.

Ordnance Technical Data Sheet

U.S. Bomb, MK 3 & MK 4 (Practice)



Nomenclature:	Bomb, Practice, MKs 3 & 4
Ordnance Family:	Bomb
DODIC:	Not Provided
Filler:	Photo Flash Powder Spotting Charge
Filler weight:	Not Provided
Item Weight:	1.36 kg (2.998 lbs)
Diameter:	55.37 mm (2.18 in)
Length:	209.55 mm (8.25 in)
Maximum Range:	Not Provided
Fuze:	Impact

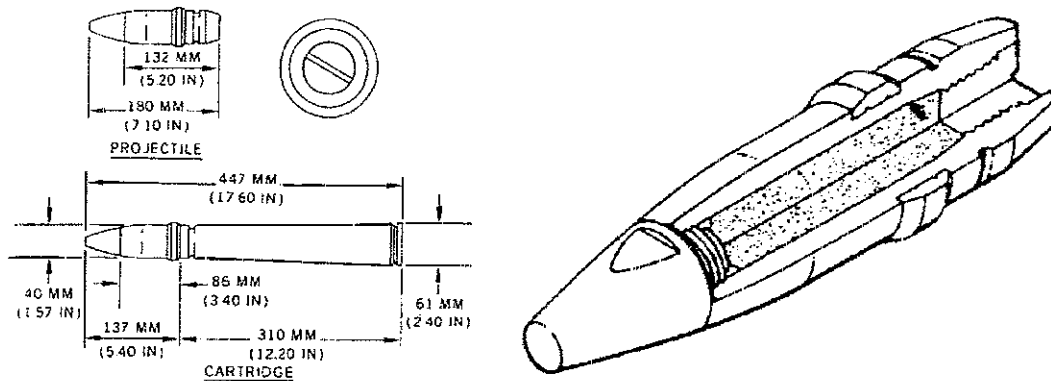
Usage: These bombs are impact fired signal-generating, practice bombs used for training aircrews. **WARNINGS:** Do not drop or jar a loaded practice bomb. These bombs contain no positive safety features. Keep hands clear of the flash tube and emission holes. Accidental firing of the signal cartridge could cause injury. Do not attempt to pry the firing pin assembly or signal cartridge out of a practice bomb. Prying could initiate the signal cartridge.

Description: The Mk 3 and Mk 4 bombs are unpainted with markings cast into the bomb body. The Mk 5 Mods 0, 1, 2, & 3, AN-Mk 23 Mods 0 & 1, and Mk 43 Mods 0 & 1 bombs are unpainted with markings cast or stamped into the bomb body. The Mk 3, Mk 4, Mk 5, and Mk 43 practice bombs (not shown) are externally identical to the AN-Mk 23 bomb.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

U.S. PROJECTILE, 40-MM, AA, BL&P, MK 1, MK 2



Nomenclature:	40 mm Anti-Aircraft BL & P MK1, MK2
Ordnance Family:	Projectile
DODIC:	Not Provided
Filler:	N/A
Filler weight:	N/A
Item weight:	907.20 g (32 oz)
Diameter:	40.00 mm (1.575 in)
Length:	180.00 mm (7.987 in)
Maximum Range:	Not Provided
Fuze:	Not provided

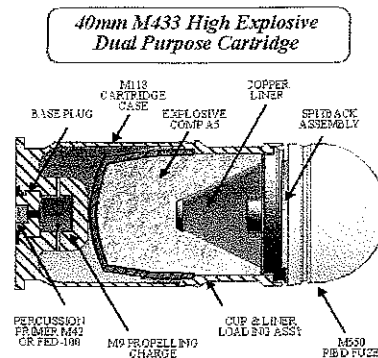
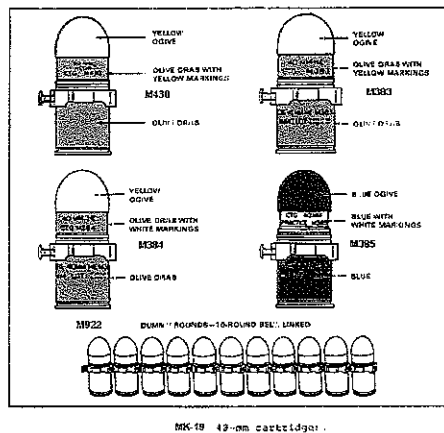
Usage: These are Navy, spin stabilized, gun fired projectiles.

Description: The BL&P type contains the ALN prefix "UF" stenciled in black. If of early manufacture, the projectile and fuze or nose plug is red. If of recent manufacture, the projectile is blue with white body stenciling.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

U.S Grenade, 40 MM (HEAT)



Nomenclature: 40 MM Grenade
Ordnance Family: Projectile
DODIC: B564
Filler: Explosive Comp A5
Filler weight: \pm 57.00 g (2.01 oz)
Item weight: 340 g (11.99 oz)
Diameter: 40 mm (1.57in)
Length: 79 mm (3.11in)
Fuze: M550 (Impact Fuze)

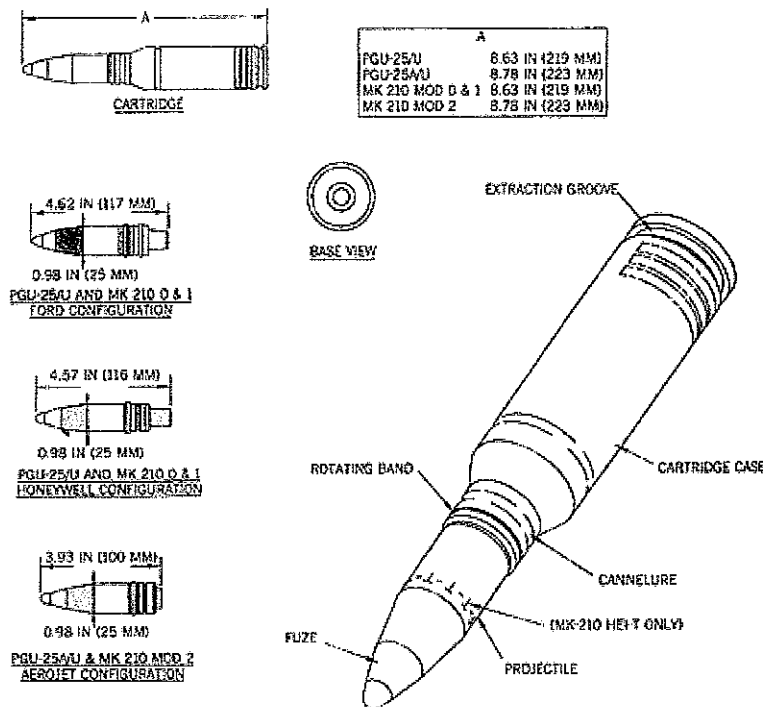
Usage: Light Support Weapon Providing capability for Anti-personnel, anti-vehicle, anti-material, and training depending on type of round selected. Maximum range 400m (437 yards)

Description: The projectiles are olive drab with anodized gold ogives. The M383 has white markings; the M384 and M677 have yellow markings.

Reference: ORDATA Online, Midas.

Ordnance Technical Data Sheet

20 MM HEI-T



D4406_03

Nomenclature: 20 mm HEI-T
Ordnance Family: Projectile
DODIC: A775
Filler: PBXN-5 and Zirconium Pellets
Filler weight: \pm 31.9 g
Item weight: 185.9 g
Diameter: 25.00 mm
Length: 100.00 mm
Maximum Range: 2000m (6560 ft)
Fuze: M505A3 (Mechanical Time Super Quick)

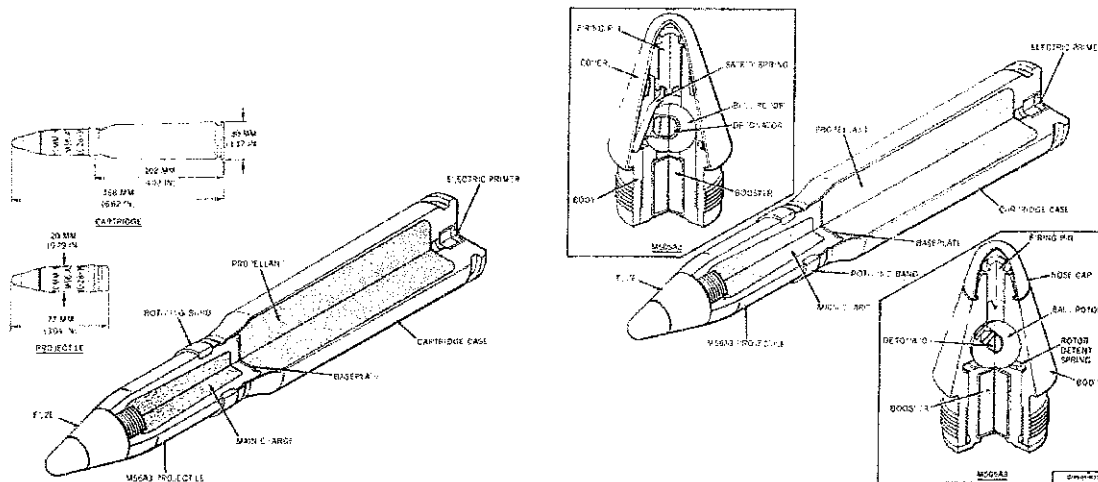
Usage: The PGU-25/U and PGU-25A/U are percussion-primed, fixed-ammunition cartridges incorporating a high-explosive-incendiary projectile. The Mk 210 Mod 2 is a percussion-primed, fixed-ammunition cartridges incorporating a high-explosive-incendiary-with-tracer projectile. The projectile use an M505A3 centrifugally armed, point-detonating superquick fuze.

Description: The cartridge cases are unpainted. The PGU-28/B projectile has an unpainted noseplug and a yellow-painted body with red and black bands.

Reference: ORDATA Online

Ordnance Technical Data Sheet

U.S. CARTRIDGE, 20-MM, HEI, M56, M56A1, M56A2, M56A3, & M56A4



Nomenclature:	20 mm HEI (High Explosive Incendiary)
Ordnance Family:	Projectile
DODIC:	A582
Filler:	RDX, Wax, Aluminum (A-1X-2)
Filler weight:	9.00 g (.3675 oz)
Item weight:	102.06 g (3.619 oz)
Diameter:	20.00 mm (.7874 in)
Length:	77.00 mm (3.031 in)
Maximum Range:	Not Provided
Fuze:	PD (Point Detonating)

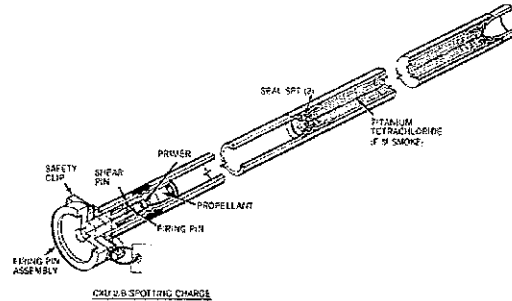
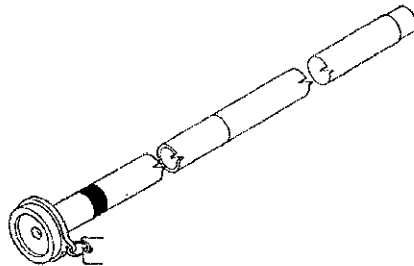
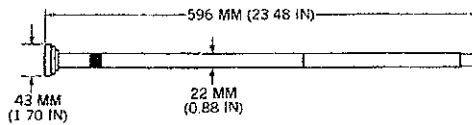
Usage: These are electrically primed cartridges with high-explosive-incendiary projectiles and centrifugally armed, point-detonating fuzes. They are used in the M39, M61, and M168, and M195 automatic cannons.

Description: The cartridge case is unpainted but has nomenclature and loading information stenciled on it. Cartridges of current manufacture have projectiles painted yellow with a red band below the fuze. Projectiles of earlier manufacture were painted yellow overall, or red with an olive drab ogive. Nomenclature and loading information is stenciled in black on the projectile body and may be stamped in the rotating band. The fuze is unpainted and unmarked.

Reference: ORDATA Online, Midas.

Ordnance Technical Data Sheet

U.S. BOMB, SPOTTING CHARGE, CXU-2/B



Nomenclature:	SPOTTING CHARGE, CXU-2/B
Ordnance Family:	Pyrotechnic/Signals
DODIC:	obsolete
Filler:	Smoke, FM (Titanium Tetrachloride)
Filler weight:	42.53 g (1.5 oz)
Item weight:	295.00 g (10.41 oz)
Diameter:	22.00 mm (.8661 in)
Length:	596.00 mm (23.46 in)
Maximum Range:	
Fuze:	Impact

Usage: These are signal-generating signal cartridges and spotting charges. They are used in various size practice bombs to provide visual observance of target impact in the bombing of surface and water targets.

Description: The CXU-2/B is painted light green with a 13-millimeter (0.50-inch) red band with markings depicting nomenclature, part number, NSN, DOD No., and Lot No.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

U.S. CARTRIDGE, BOMB, PRACTICE, KC 4



Nomenclature:	Cartridge, Bomb, Practice, KC 4
Ordnance Family:	Bombs
DODIC:	Not Provided
Filler:	Red Phosphorus
Filler weight:	24.00 g (.85 oz)
Item weight:	45.40 g (1.6 oz)
Diameter:	20.00 mm (.7874 in)
Length:	127.00 mm (5 in)
Maximum Range:	Not Provided
Fuze:	Impact fired

Usage: The KC 4 Cartridge Practice Bomb is used with other aircraft-dropped practice bombs to indicate the point of bomb impact. It is suitable for both day and night operations. When the bomb is dropped, the impact forces the firing pin against the signal primer. This ignites the expelling charge and releases the marker compound. The cartridge expels red phosphorus at impact, producing a brilliant flash of light and a puff of dense white smoke.

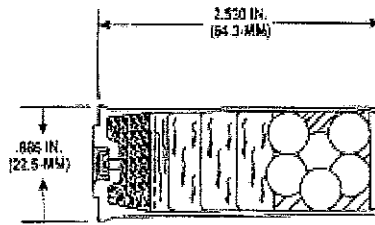
Description: The cartridge is unpainted.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

12 Gauge Shotgun, NO 00

CARTRIDGE 12 GAGE. SHOTGUN NO 00 M162



Nomenclature:	12 Gauge Shotgun, NO 00
Ordnance Family:	Small Arms
DODIC:	A011
Filler:	Smokeless Powder
Filler weight:	± Various
Item weight:	0.736 gr
Diameter:	.886 in
Length:	2.53 in. (64.3 mm)

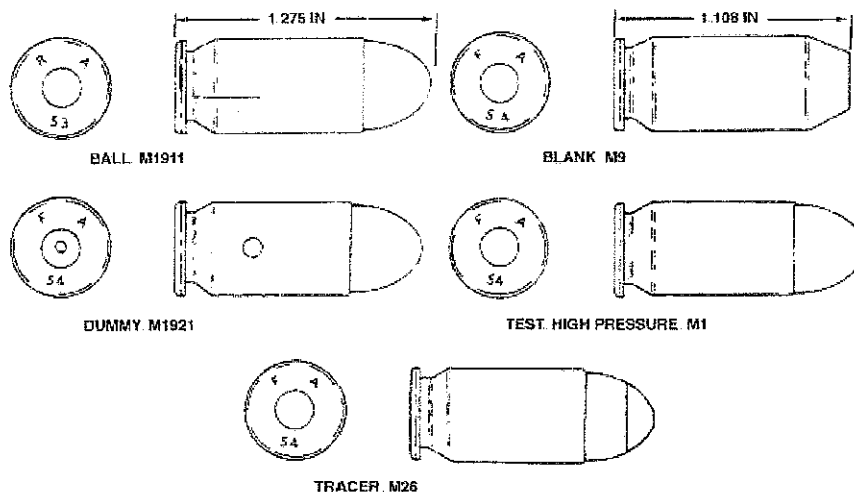
Usage: Military issue shotgun, 2-3/4 inch chamber. The cartridge is intended for guard and combat use.

Description: The cartridge case is all plastic, and is loaded with smokeless powder and No 00 commercial shot

Reference: TM 43-0001-27

Ordnance Technical Data Sheet

.45 Caliber Small Arms



Nomenclature:	45 Caliber Small Arms Ammunition
Ordnance Family:	Small Arms
DODIC:	A086
Filler:	Double Base Powder*
Filler weight:	.311 gram
Item weight:	17.63 grams
Projectile Weight:	5.64 grams
Diameter:	.45 caliber
Length:	1.256 inches

Usage: This cartridge is designed and procured for use in semiautomatic pistols for target practice and Navy Competitive Match Programs.

Description: The gilding metal jacketed bullet has a lead-antimony slug. It is 0.68 inch (1.72 centimeters) long and weighs approximately 234 grains. The cartridge is 1.256 inches (3.19 centimeters) long, contains a lead-styphnate primer and approximately 4.8 grains (.311 gram) of propellant composition.

* Double base propellants contain nitrocellulose and a liquid organic nitrate, such as nitroglycerine. As with single base, stabilizers and additives may be present. Double base propellants are used in cannon, small arms, mortars, rockets, and jet propulsion units.

Reference: TM 43-0001-27

Ordinance Technical Data Sheet

9 Millimeter, Small Arms

Nomenclature:	9 millimeter Small Arms Ammunition
Ordinance Family:	Small Arms
DODIC:	
Filler:	Double Base Powder*
Filler weight:	.388 gram
Item weight:	11.79 grams
Projectile Weight:	5.64 grams
Diameter:	9 millimeter
Length:	1.169 inches

Usage: This cartridge is for firing in revolvers, pistols, and sub-machine guns chambered for the 9mm cartridge.

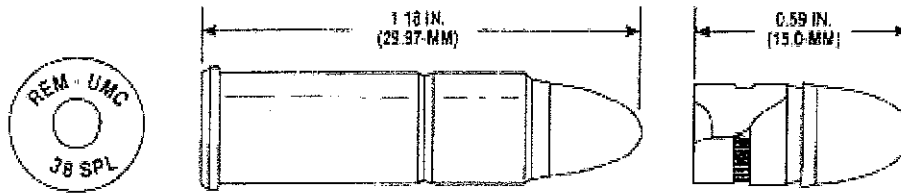
Description: The cartridge is 1.169 inches (2.96 centimeters) long, weighs approximately 182 grains (11.79 grams) and contains approximately 6 grains (.388 gram) of propellant composition.

* Double base propellants contain nitrocellulose and a liquid organic nitrate, such as nitroglycerine. As with single base, stabilizers and additives may be present. Double base propellants are used in cannon, small arms, mortars, rockets, and jet propulsion units.

Reference: TM 43-0001-27

Ordinance Technical Data Sheet

.38 Caliber Small Arms



11

Nomenclature:	.38 Caliber Small Arms Ammunition
Ordinance Family:	Small Arms
DODIC:	A408
Filler:	Single or Double Base Powder
Filler weight:	4.8 gr
Item weight:	196 gr
Projectile Weight:	60.5 gr
Diameter:	.38 Caliber
Length:	1.18 in. (29.97mm)

Usage: Caliber .38 weapons. The cartridge is for CONUS-guard or security use in caliber .38 weapons.

Description: BALL Cartridge. The cartridge is identified by a plain bullet tip

Reference: TM 43-0001-27

SMALL-ARMS AMMUNITION

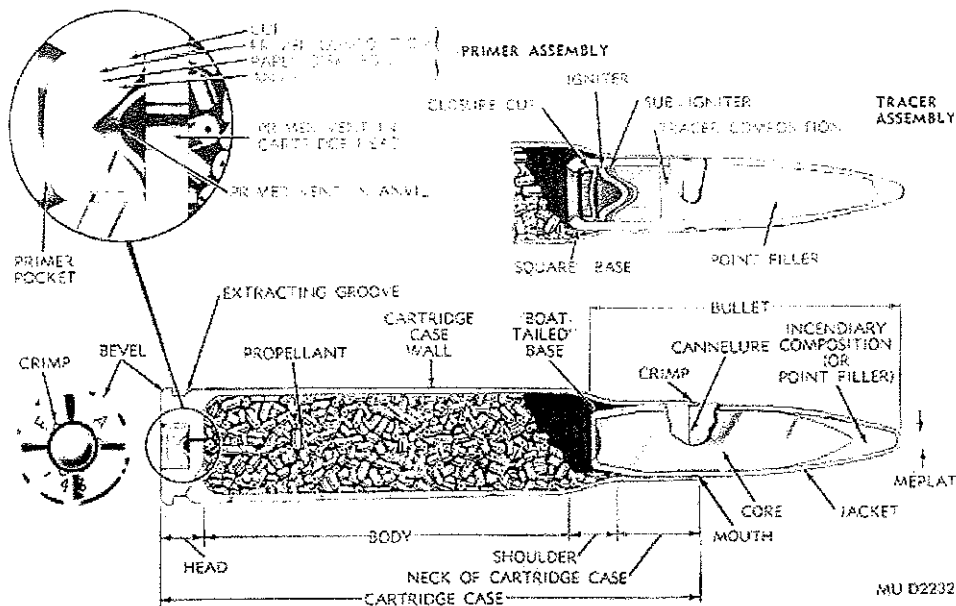


Figure 1 Typical cartridge (sectional)

General. Small-arms ammunition, as used herein, describes a cartridge or families of cartridges intended for use in various types of hand-held or mounted weapons through 30 millimeter. Within a caliber designation, these weapons may include one or more of the following: rifles (except recoilless), carbines, pistols, revolvers, machineguns and shotguns. For purposes of this publication, small-arms ammunition may be grouped as cartridges intended primarily for combat or training purposes (API, HEI, tracer or ball); for training purposes only (blank or dummy); or for special purposes (rifle grenade or spotter-tracer). Refer to TM 9-1306-200 for more detailed information on small-arms ammunition.

Cartridges. In general, a small-arms cartridge is identified as an assembly of a cartridge case, primer, a quantity of propellant within the cartridge case, and a bullet or projectile. Blank and rifle grenade cartridges are sealed with paper closure disks in lieu of bullets. Dummy cartridges are composed of a cartridge case and a bullet. Some dummy cartridges contain inert granular materials to simulate the weight and balance of live cartridges. A typical cartridge and the terminology of its components are shown in figure 1.

Case Although steel, aluminum, zinc and plastic materials have been used experimentally, brass, a composition of 70 percent copper and 30 percent zinc, is the most commonly used material for cartridge cases. Steel, as well as brass, is an approved material for caliber .45 cartridge cases. Brass, paper and plastic are used for 12 gage shotshell bodies. Aluminum is used for military-type 410 gage shotshell bodies. Configurations of cartridges and bullets are illustrated in figures 2 through 11.

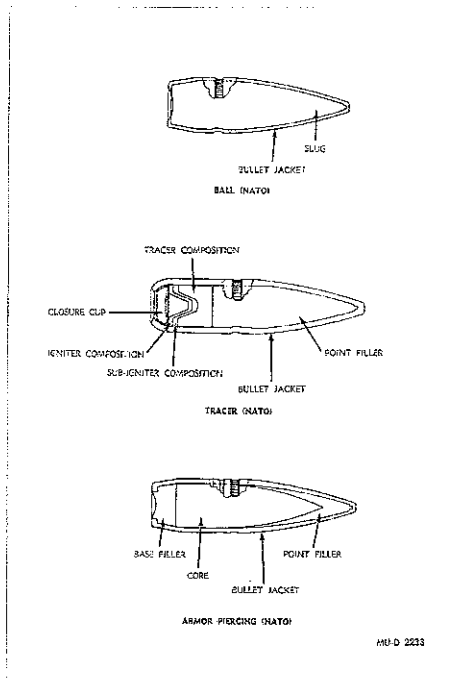


Figure 2 7.62 mm ball bullets (sectional)

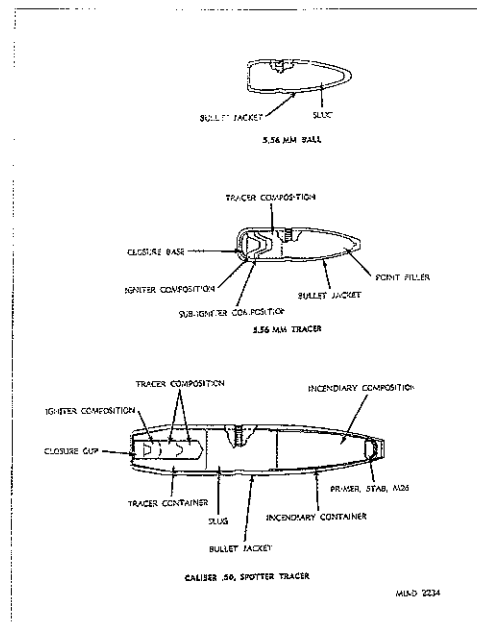


Figure 3 5.56mm and caliber .50 spotter tracer bullets (sectional)

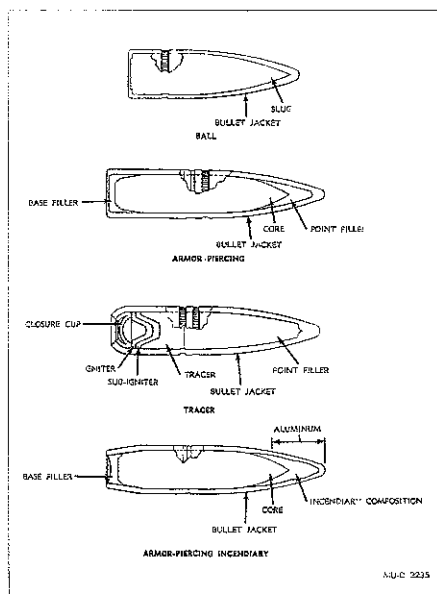


Figure 4 Caliber .30 bullet (sectional)

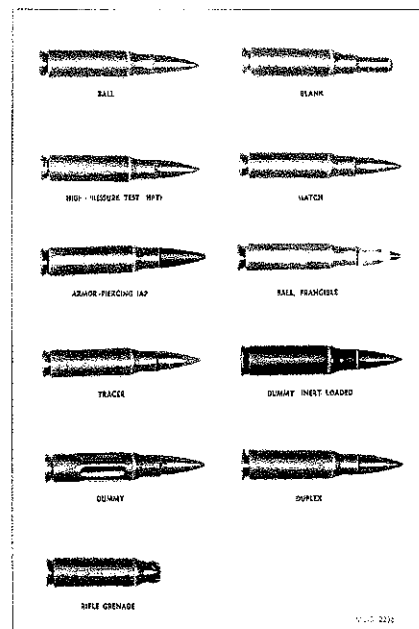


Figure 5 7.62mm cartridges

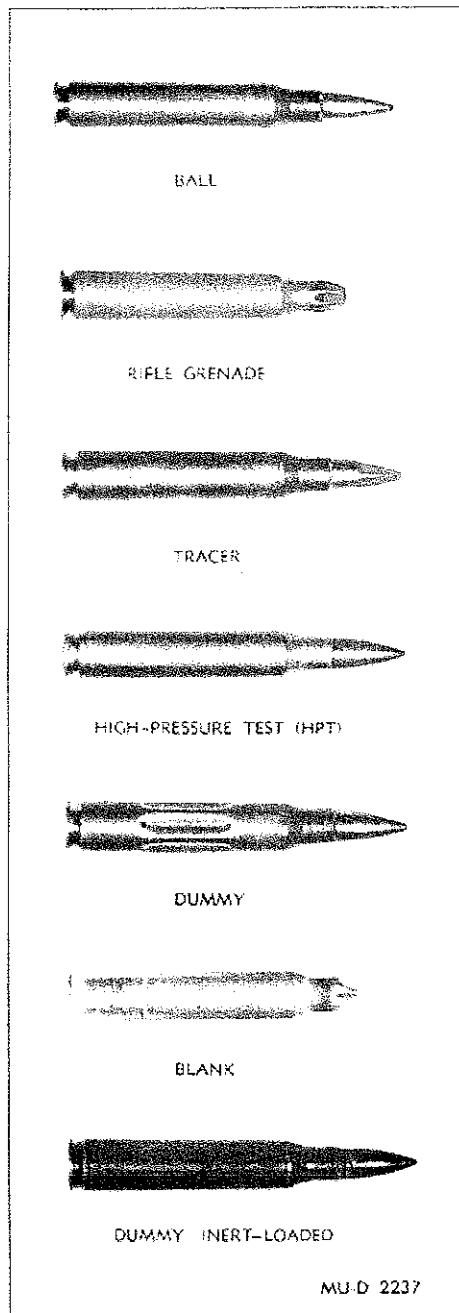


Figure 6. 56mm cartridges

Propellant Cartridges are loaded with varying weights of propellant. This is to impart sufficient velocity (within safe pressures) to the projectile to obtain the required ballistic performance. These propellants are either of the single-base (nitrocellulose) or double-base (nitrocellulose and nitroglycerine) type. The propellant grain configuration may be cylindrical with a single, lengthwise perforation, spheroid (ball) or flake. Most propellants are coated with a deterrent (to assist in controlling the rate of combustion) and with a final coating of graphite (to facilitate flow of propellant and eliminate static electricity in loading cartridges)

Primer Small-arms cartridges contain either a percussion or electric primer. The percussion primer consists of a brass or gilding metal cup that contains a pellet of sensitive explosive material secured by a paper disk and a brass anvil. The electric primer consists of an electrode button in contact with the priming composition, a primer cup assembly and insulator. A blow from the firing pin of the weapon on the center of the percussion primer cup base compresses the primer composition between the cup and the anvil. This causes the composition to explode. The function of the electric primer is accomplished by a firing pin with electrical potential, which contacts the electrode button. This allows current to flow through the energy-sensitive priming composition to the grounded primer cup and cartridge case, exploding the priming composition. Holes or vents in the anvil or closure cup allow the flame to pass through the primer vent in the cartridge case and ignite the propellant. Rimfire ammunition, such as the caliber .22 cartridge, does not contain a primer assembly. Instead, the primer composition is spun into the rim of the cartridge case and the propellant is in intimate contact with the composition. On firing, the firing pin strikes the rim of the cartridge case, compressing the primer composition and initiating its explosion.

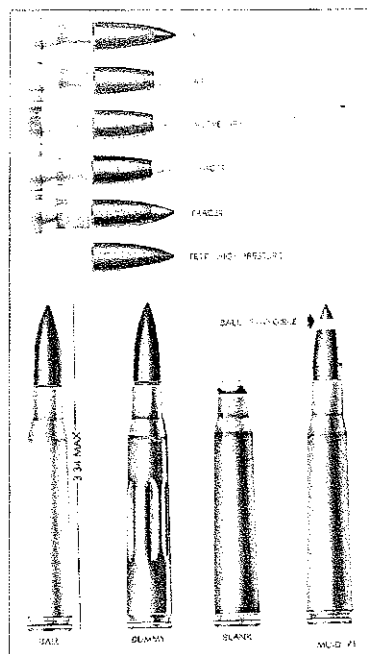


Figure 7 Caliber .30 cartridges

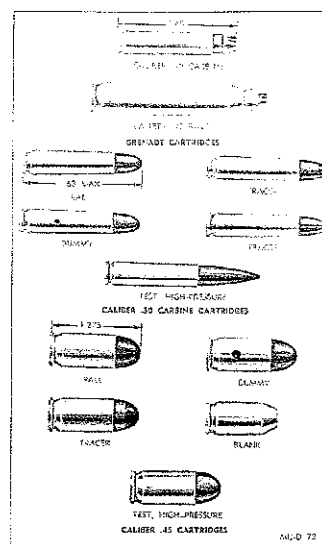


Figure 3. Caliber .307 Winchester and caliber .45 cartridges

Bullet. With few exceptions, bullets through caliber .50 are assemblies of a jacket and a lead or steel core. They may contain other components or chemicals which provide the terminal ballistic characteristics of the bullet type. The bullet jacket may be either gliding metal, gliding-metal clad steel, or copper plated steel. Caliber .30 and 7.62mm frangible bullets are molded of powdered lead and a friable plastic which pulverizes into dust upon impact with the target. The pellets used in the shotgun shells are spheres of lead alloys varying from 0.08 inch to 0.33 inch in diameter.

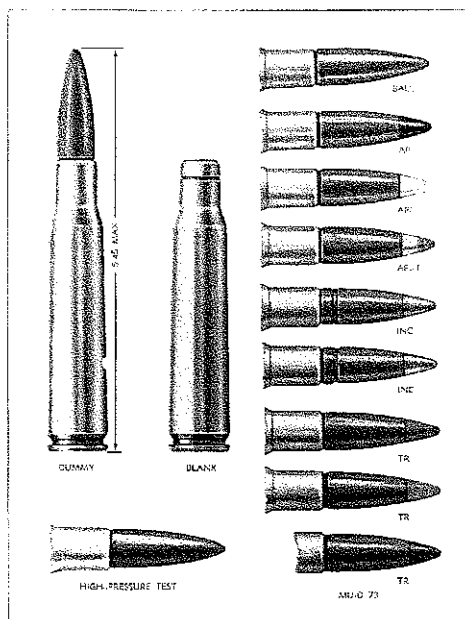


Figure 9 Caliber 50 cartridges

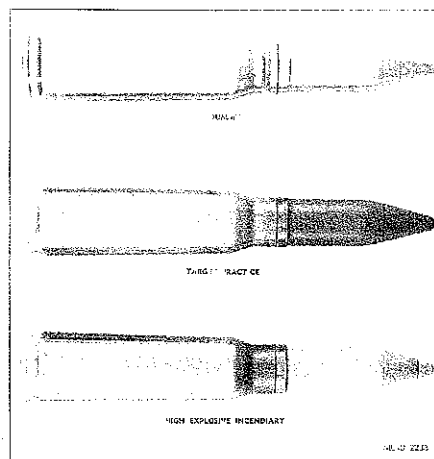


Figure 10. 20mm cartridges

Ball Cartridge. The ball cartridge is intended for use in rifles, carbines, pistols, revolvers and/or machineguns against personnel and unarmored targets. The bullet, as designed for general purpose combat and training requirements, normally consists of a metal jacket and a lead slug. Caliber .50 ball bullet and 7.62-mm. Ball M59 bullet contain soft steel cores.

Tracer Cartridge. By means of a trail of flame and smoke, the tracer cartridge is intended to permit visible observation of the bullet's in-flight path or trajectory and the point of impact. It is used primarily to observe the line of fire. It may also be used to pinpoint enemy targets to ignite flammable material and for signaling purposes. The tracer element consists of a composition of pyrophoric, pyrotechnic compounds and a fuel. The bullet's composition is ignited by the propellant when the cartridge is fired. In flight, the bullet emits a bright flame which is visible to the gunner. Tracer burnout occurs at a range between 400 and 1,600 yards, depending upon the caliber of ammunition.

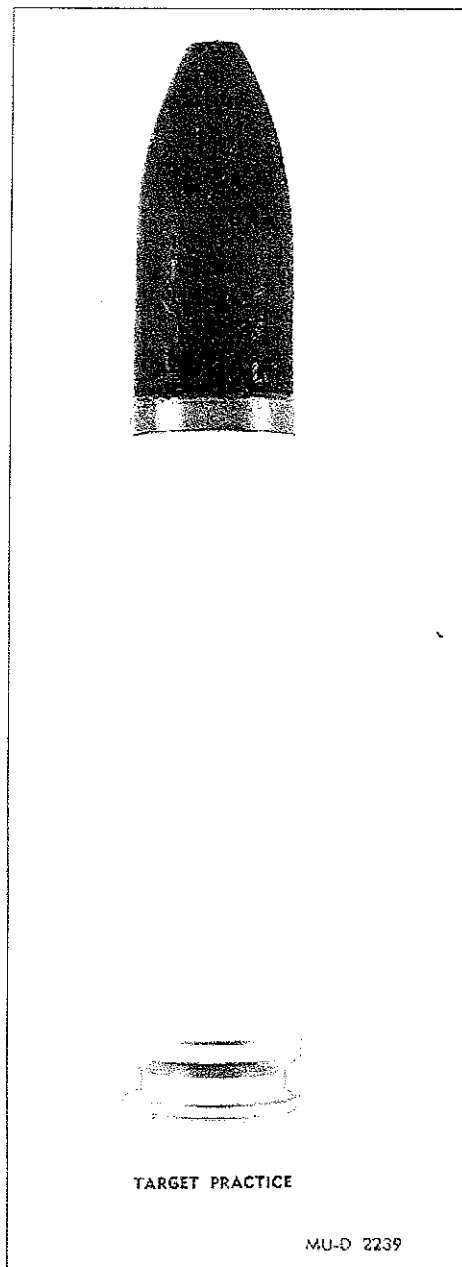


Figure 11. Typical 30mm projectile

Match Cartridge. The match cartridge is used in National and International Match Shooting competitions. The bullet consists of a gliding-metal jacket over a lead slug

The cartridges are identified on the head face with the designation NM (National Match) or Match.

Armor-Piercing Cartridges. The armor-piercing cartridge is intended for use in machine-guns or rifles against personnel and light armored and unarmored targets, concrete shelters, and similar bullet-resisting targets. The bullet consists of a metal jacket and a hardened steel-alloy core. In addition, it may have a base filler and/or a point filler of lead.

Armor-Piercing-Incendiary Cartridge. The armor-piercing-incendiary cartridge is used in rifles or machineguns as a single combination cartridge in lieu of separate armor-piercing and incendiary cartridges. The bullet is similar to the armor-piercing bullet, except that the point filler is incendiary mixture instead of lead. Upon impact with the target, the incendiary mixture burst into flame and ignites flammable material.

Armor-Piercing-Incendiary Tracer Cartridge. The bullet of the armor-piercing-incendiary-tracer cartridge combines the features of the armor-piercing, incendiary, and tracer bullets and may be used to replace those cartridges. The bullet consists of a hard steel core with compressed pyrotechnic mixture in the cavity in the base of the core. The core is covered by a gilding-metal jacket with incendiary mixture between the core point and jacket. This cartridge is for use in caliber .50 weapons only.

Duplex Cartridge. The duplex cartridge contains two special ball type bullets in tandem. The front bullet is positioned partially in the case neck, similarly to a standard ball bullet. The rear bullet, positioned completely within the case, is held in position by a compressed propellant charge. The base of the rear bullet is angled so that in flight, it follows a path slightly dispersed from that of the front bullet.

Appendix E: Response to Comments

Naval Weapons Seal Beach, Detachment Fallbrook
Draft Final Preliminary Assessment for the Munitions Response Program, August 2005
Comments (received from DTSC and CA RWQCB) and Responses (Malcolm Pirnie)
May 2006

Document: Draft Final Preliminary Assessment for the Munitions Response Program - Naval Weapons Seal Beach, Detachment Fallbrook

Commenter	Comment Number	Page Number/Section	Comment	Response
CA RWQCB	1	General Comment	Several of the sites presented in the PA that require additional environmental activities to address munitions related waste, also involve non-munitions related waste. The proposed recommendations for these sites solely address munitions issues. It is the Regional Board's positions that the non-munitions related waste at these sites might pose a threat to the quality of waters of the state and warrant investigation. Please provide the Navy's intention, including time frame, to address these wastes.	The focus of this PA is munitions and explosives of concern (MEC) and munitions constituents (MC). For those sites requiring further investigation under the Munitions Response Program (MRP), the presence or absence of potential chemicals of concern beyond MC will be evaluated as necessary. Those sites not being recommended for further action are being addressed under the Installation Response Program (IRP).
CA RWQCB	2	General Comment	Throughout the PA the Installation is described as a fenced installation. If possible, please provide information regarding the fence construction, materials, height, etc. Such information is useful to evaluate the potential for individuals and domestic animals to access the installation	The basic details about the fence were added to the PA. Section 2.1 now reads: "The installation currently occupies 8,852 acres and is surrounded by a chainlink fence."

Commenter	Comment Number	Page Number/Section	Comment	Response
CA RWQCB	3	General Comment	<p>and MMRP Sites and be exposed to munitions and explosives of concern (MEC) and munitions constituents (MC).</p> <p>According to the PA, cattle are allowed to graze at the installation to reduce vegetative fuel load. Please identify the type(s) of cattle. It would seem that there is a potential for these cattle to be an exposure route for human and domestic animal receptors ingesting contaminated bovine products (milk, meat), which does not appear to be identified as potentially complete pathway in the exposure pathway analyses for the Sites with munition constituents (MC) concerns. Please provide a discussion as to why this pathway is not considered to be potentially complete.</p>	<p>The grazing program involving dairy cows was discontinued towards the end of 2004. Therefore, cattle are no longer considered an ecological receptor.</p>
CA RWQCB	4	General Comment	<p>There appears to be a discrepancy in the Exposure Routes identified for the Food Chain Exposure Media in the MC Exposure Pathway Analyses presented for different sites. As an example, Figure 5.1-5 identifies prey as an exposure route, whereas Figure 5.2-6 identifies game/fish/prey. It is unclear, whether this is intentional or an oversight. Please review, and either rectify the discrepancy or provide clarification, whichever is appropriate.</p>	<p>The discrepancies have been corrected in each of the exposure pathway figures. Prey is considered the only exposure route at the installation. The installation does not support hunting, so game is not considered a potential exposure pathway through the food chain. At this time, fishing at the lakes has been suspended until further investigation by IRP and MRP. Therefore, fish are not considered a potential pathway through the food</p>

Commenter	Comment Number	Page Number/Section	Comment	Response
CA RWQCB	5	General Comment	Discussions of receptors and pathways for each site include the building identification number for buildings near/ within the Site. To the extent practicable, augment the discussions to include the activity type, duration, and frequency. Additionally, provide the distance between the Sites and the nearest housing area.	<p>chain.</p> <p>Information was added to the PA for the following buildings: 301, 307, 338, 365, 366, 679, 701, 736, and 763. The following text has been added:</p> <ul style="list-style-type: none"> • "The closest building to the Dunnage Disposal Site #1 is Building 301, located to the north of Redeye Road. Building 301 is the VERTREP Storage Locker, which is accessed by two to three people per day."; • "Building 307 is located to the west and Building 365 is located to the east of the Salvage Yard Landfill. Both buildings are used by the Naval Surface Warfare Center (NSWC) Crane for their engineering offices, and have 10 to 15 personnel at any given time."; • For Dunnage Disposal Site #4: "The remnant foundation of what may once have been Building 338 remains on the site."; • For the Skeet/Trap Range: "Building 366 is located approximately 2,790 feet southwest of the site. The building is currently not in use and is

Commenter	Comment Number	Page Number/Section	Comment	Response
				<p>on a list to be demolished.";</p> <ul style="list-style-type: none"> • Depot Lake "is located just north of Terrea Road and between buildings 763 and 736. Neither building is currently being used."; and • Dunnage Disposal Site #2: "Building 701 is located approximately 300 feet from the northern border of the site. Building 679 is located approximately 1,380 feet from the eastern border of the site. Both buildings are currently unused."
CA RWQCB	6	General Comment	<p>The MC discussion for several sites mentions metals only for small arms. Based on the information presented in PA Appendix D (Ordnance Technical Data Sheets), it seems that metals as an MC also is appropriate for the other non-small arms munitions found at Sites. Additionally, at sites where activities involved waste burning, and assessment of the fuel(s) used to ignite the waste and waste burning by/breakdown products is warranted as part of future environmental investigative activities.</p>	<p>The MC discussion was clarified, where it was appropriate, to include metals for non small arms munitions. The presence or absence of potential chemicals of concern will be further evaluated as part of future investigations.</p> <p>The text discussing the munitions below now includes the following metals:</p> <ul style="list-style-type: none"> • Rifle grenades: zinc oxide smoke and aluminum powder; • 75-mm projectiles: iron; • 60-mm and 81-mm mortars: zinc oxide smoke and aluminum powder;

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				<ul style="list-style-type: none"> Pyrotechnics/blasting caps: titanium tetrachloride, lead styphnate, magnesium, barium, strontium, and lead azide; 20-mm, 40-mm, and 60-mm cartridges: zirconium pellets, beryllium, chromium, cobalt, copper, lead, manganese, lead azide, lead styphnate, antimony sulfide, zinc, zinc stearate, aluminum, cadmium, copper salt, zinc phosphate, lead chromate (VI), and lead naphthenate; 25-pound bomb: titanium tetrachloride; 3-pound pyrotechnic bomb: powdered aluminum and lead; and 7.2-inch projector charges: lead and aluminum.
CA RWQCB	7	General Comment	There is a discrepancy in the MEC Exposure Pathway Analyses presented for the QE Test Area Site, Salvage Yard Landfill Site, and Dunnage Disposal Sites #1 and #3 regarding whether the pathway is complete or potentially complete for intrusive activity. The exposure pathway is identified as complete for the QE Test Area Site and	<p>All MEC Exposure Pathway Analyses were modified to show the following: Given that MEC was observed on the surface at QE Test Area Site, Salvage Yard Landfill Site, and Dunnage Disposal Sites #1 and #3, the handling/treading pathway was selected as complete.</p>

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			potentially complete for the other three Sites. Based on the presence of MEC at all the Sites and similar site conditions, it is unclear as to why there is a discrepancy regarding the completion of the exposure pathway at the Sites. Please review the relevant MEC Exposure Pathway Analyses Figures and rectify the discrepancy or provide the rationale supporting discrepancy. Additionally, consider including a discussion of the distinction between complete and potentially complete exposure pathways.	All intrusive pathways were selected as potentially complete until it is known that MEC exists underneath the surface.
CA RWQCB	8	Page 1-4, Subsection 1.4 Preliminary Assessment Approach	The preliminary assessment approach description does not specifically mention the review of historical aerial photographs of the Installation and each site. Provide clarification as to whether or not these records were reviewed. If the aerial photos were reviewed, please include relevant and detailed information (dates and scale), findings, and conclusions for the entire Installation and each site the PA addresses. Additionally, the aerial photographs need to be included in a PA Appendix, if possible. If the aerial photographs were not reviewed, based on the Regional Board's experience, historical aerial photographs can provide	Aerial photos were acquired from the National Archives and from the Seabee Museum at Port Hueneme. The text has been revised to clarify the data sources and types. Section 1.4 now reads: "This PA includes and makes use of all available data relating to munitions use at Detachment Fallbrook, including historical records, aerial photographs, field data, anecdotal evidence, interviews with site personnel, and professional knowledge and experience." Photos that provided useful information were added to Appendices A and B.

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			useful information regarding the type, location, and boundaries of historical activities conducted at the Installation and each site, and should be reviewed as part of the PA. A potentially useful resource regarding this matter is the extensive historical aerial photographs collection maintained at Whittier College, which provided very useful information regarding sites and military installations in the past.	
CA RWQCB	9	Page 2-1, Section 2.0 Installation Background	Expand the description of the Installation to include the presence and location of installation housing discussed in Table 5.3-1. The discussion should include whether or not children and pets are allowed in the residential units. With the exception of the subsurface soil media, it seems there is potential for pets to encounter all the exposure media, which are not considered in the Exposure Pathway Analysis for any of the Sites. Please provide the rationale for eliminating this receptor.	The section was expanded to include more details on the housing area at the installation. The text in the report now reads "The one housing complex at the installation is located in the northeast portion of the installation and is classified as all family housing with a total of nine housing units - five single family units and two duplex units. Both children and pets are allowed at the housing complex, and the housing complex is fully occupied as of the date of this report." Pets would only be potentially exposed to potential MEC and MC at the Salvage Yard Landfill Site, which is the only site in the proximity of the installation housing. They are covered as receptors under the domestic animals category.

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CA RWQCB	10	Page 3-7, Subsection 3.7 Hydrology, Watersheds, and Water Resources	Expand Subsection 3.7 to include a discussion that the City of Oceanside (San Luis Rey Watershed) and Marine Corps Base Camp Pendleton (Santa Margarita Watershed), both located hydraulically down gradient of NWS Fallbrook, extract and use ground water as a potable water supply. Additionally, expand the discussion to include the fact that Marine Corps Base Camp Pendleton currently uses water from the Santa Margarita River to recharge the ground water aquifer that is used for municipal/domestic purposes (Stetson Engineers Inc., 2001). These sensitive receptors need to be taken into consideration in the PA Conceptual Site Models and Exposure Pathway Analyses for sites involving potential surface and/or ground water impact (s).	Concur. Information was added to Section 3.7 to clarify the connection between the NWS Fallbrook hydrology and the City of Oceanside and Marine Corps Base Camp Pendleton. The following text was added to Section 3.7: "MCB Camp Pendleton, located in Santa Margarita River watershed, and the City of Oceanside, in the San Luis Rey River watershed, are located hydraulically down gradient from Detachment Fallbrook. Both extract and use groundwater as a potable water supply; the groundwater aquifers are recharged by percolation from overlying streams and rivers. Also MCB Camp Pendleton uses water from the Santa Margarita River and from Fallbrook Creek as water sources for its artificial Lake O'Neill, which is used to supplement its water supply and for recreational purposes. At Lake O'Neill, no swimming is permitted. Fishing is permitted all year round. The fishing program includes a partial catch and release program based on posted signage."
CA RWQCB	11	Site Specific Comments	Page 5-1, Subsection 5.1.1 History and Site Description	The firing line is of environmental significance. The following text has been

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		Fallbrook SF Small Arms Range	Discussions of the Site are focused primarily on the target area and the natural soil berm, located behind the target area. Please provide a discussion as to why the area in the vicinity of the firing line is not of environmental significance.	added to Section 5.1.1: "The SF Small Arms Range was oriented for firing to the southwest, with the firing points located on the northernmost portion of the range. MC would likely be located throughout the range fan, including in the soil from the former backstop berm, in surface soils located adjacent to the berm, and near the firing line."
CA RWQCB	12	Site Specific Comments Fallbrook SF Small Arms Range	Page 5-16, Subsection 5.1.11, Plant/Animal Uptake Based on the discussion, it seems that there is a potentially complete exposure pathway for the biota receptor via the domestic animal exposure route, which is not illustrated in Figure 5.1-5.	The grazing program involving dairy cows was discontinued towards the end of 2004. Therefore, cattle are no longer considered an ecological receptor.
CA RWQCB	13	Site Specific Comments Fallbrook SF Small Arms Range	Page 5-17, Subsection 5.1.11, Ground water The discussion of the incomplete pathway for all receptors regarding vapor inhalation contradicts the information presented in Figure 5.1-5, which illustrates a potential exposure pathway for biota. Please review, and either rectify the discrepancy or provide clarification, whichever is appropriate.	Figure 5.1-5 was modified to reflect the incomplete pathway as described in Section 5.1.11.
CA RWQCB	14	Site Specific Comments	Page 5-19, Subsection 5.1.13 Recommendations	As discussed in Section 5.1.13, samples will be analyzed for the full metal

Commenter	Comment Number	Page Number/Section	Comment	Response
		Fallbrook SF Small Arms Range	The recommendation for future environmental activities includes an assessment of lead. Based on the discussion presented in Subsection 5.1.6 and Appendix D (Ordnance Technical Data Sheets), it seems a screening of several other munitions constituents; such as antimony, arsenic, copper, nickel, zinc, and constituents associated with black and smokeless powder; also is warranted at this Site.	spectrum. The presence or absence of potential chemicals of concern will be evaluated in future investigations.
CA RWQCB	15	Site Specific Comments Fallbrook SF Small Arms Range	Page 5-20, Figure 5.1-5 According to the MC Exposure Pathway Analysis, a potentially complete pathway for biota inhaling impacted ground water vapors. Such a pathway seems unlikely; please provide a discussion supporting this conclusion. Based on site conditions it seems that the food chain exposure routes should be expanded to include fish and game.	Figure 5.1-5 was modified to reflect the incomplete pathway as described in Section 5.1.11. Hunting is not supported at NWS Fallbrook. At this time, fishing at the lakes has been suspended until further investigation by IRP and MRP. Therefore, game and fish are not considered potentially complete pathways.
CA RWQCB	16	Fallbrook QE Test Area	Page 5-24, Figure 5.2-1 Figure 5.2-1 is a photograph that illustrates the presence of several white objects of various sizes at the Site. If possible, identify what the objects are in the figure description.	Concur. The following information was added to the caption for the photograph. "The white objects are concrete huts that were used for shelter, viewing platforms, and storage of the targets on the site."
CA RWQCB	17	Fallbrook QE Test Area	Page 5-26, Subsection 5.2.2 Visual Survey Observations and Results	No schematics were found for the construction of the burn/slit trenches.

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CA RWQCB	18	Salvage Yard Landfill	<p>If possible, include relevant construction details of the burn/slit trenches. Details of particular concern involve containment of waste and waste byproducts. The discussion of site observations mentions the presence of two small round metal burn pits. Are these objects the metal barrels mentioned in Subsection 5.2.1?</p> <p>Page 5-52, Subsection 5.3.7 Contaminant Migration Routes Based on the proximity of an ephemeral stream and site topography, it seems that a potential contaminate migration route at the Site is surface water, which is not presented. Please provide a discussion as to why the surface water route is not a concern.</p>	<p>The round metal burn pits are the metal barrels identified in Section 5.2.1. Identification of the two metal barrels was added to Figure 5.2-4.</p> <p>The potential for surface water to serve as a migration route was added to Section 5.3.7. Section 5.3.7 now reads: "Migration of MC may occur through surface soil erosion due to runoff and wind. Future construction, excavation, and maintenance at the site are also potential release mechanisms. MC in runoff could potentially end up in surface water or sediment. MC could also potentially leach through soils or surface waters to groundwater."</p>
CA RWQCB	19	Salvage Yard Landfill	<p>Page 5-53, Subsection 5.3.8.2 Building Near/Within Site If possible, please provide the years Buildings 307 and 365 were constructed. This information will assist establishing Site boundaries.</p>	<p>The construction dates for the buildings were unavailable. Available information on buildings 307 and 365 was added to subsection 5.3.8.2. The text now reads "Building 307 is located to the west and Building 365 is located to the east of the Salvage Yard Landfill. Both buildings</p>

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				are used by the Naval Surface Warfare Center (NSWC) Crane for their engineering offices, and have 10 to 15 personnel at any given time."
CA RWQCB	20	Salvage Yard Landfill	Page 5-61, Subsection 5.3.11 Surface Soil Based on the discussion regarding the surface soil exposure media, it seems that there is a potentially complete pathway for domestic animals, which is not illustrated in Figure 5.3-5. Please review and provide clarification.	Figure 5.3-5 was modified to reflect the pathways for domestic animals discussed in the text. The domestic animal category only applies to pets at the housing complex since cattle no longer graze at the installation.
CA RWQCB	21	Salvage Yard Landfill	Page 5-61, Subsection 5.3.11 Ground Water The discussion of the ground water vapor inhalation exposure route seems to contradict the information presented in Figure 5.3-5. The exposure route is described as incomplete in subsection 5.3.11 and potentially complete in Figure 5.3-5. Please review, and either rectify the discrepancy or provide clarification, whichever is appropriate.	Figure 5.3-5 was modified to reflect the incomplete pathway as described in Section 5.3.11.
CA RWQCB	22	Dunnage Disposal Site #1	Page 5-69, Subsection 5.4.1.1 Topography According to this Subsection there are some burial pits within the boundaries of Dunnage	The Dunnage Disposal Site #1 description was clarified to specify there are no visible burial pits, but suspected

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			Disposal Site #1. To the extent practicable, indicate the location of the pits on a map and provide information regarding the number and approximate dimensions of the pits.	ground disturbances/ burials. The text was referring to the moderately deep ravines created by runoff and ephemeral streams at the site. Further investigation of possible burial pits will be investigated during the Site Inspection. The text now reads "The Dunnage Disposal Site #1 contains low hills with some moderately deep ravines created by runoff and ephemeral streams."
CA RWQCB	23	Dunnage Disposal Site #1	Page 5-72, Subsection 5.4.4 MEC Presence In the second sentence of Subsection 5.4.4, there is a discussion of a "Bombing Crater Site". Please provide additional information regarding the location, dimensions, and nature of this apparent Dunnage Disposal Site #1 Subsite.	The discussion of a "Bombing Crater Site" is in error. The discrepancy was corrected. There is no "Bombing Crater Site" at the Dunnage Disposal Site #1 or anywhere else on Detachment Fallbrook. The discussion was unintentionally included from the NAWS China Lake PA.
CA RWQCB	24	Dunnage Disposal Site #2	Page 5-93, Subsection 5.5.6, 5.5.7, and 5.5.8 Please note that there is a discrepancy in the PA regarding the presence of MC at the Dunnage Disposal Site #2. According to Subsection 5.5.6 and 5.5.7, MC are not expected to be present at Dunnage Disposal Site #2, yet according to Subsection 5.5.8, there is a potential for receptors to come into contact with MC. This discrepancy also is	MC are not suspected at the Dunnage Disposal Site #2. Section 5.5.8 and Table 5.5-1 have been modified to correct this discrepancy. Section 5.5.8 now reads "MEC and MC are not expected to be present at the site; potential receptors and pathways are not of concern."

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			an issue in Table 5.5-1. Please review, and either rectify the discrepancy or provide clarification, whichever is appropriate.	
CA RWQCB	25	Dunnage Disposal Site #2	Page 5-94, Subsection 5.5.8.2 The information presented in this Subsection regarding the presence of buildings in the vicinity of Dunnage Disposal Site #2 conflicts with information presented in Map 5.5-2. According to the Subsection 5.5.8.2, there are no buildings within a 0.5 miles radius of the Site, yet Map 5.5-2 illustrates the presence of Building 701 approximately 100 meters to the north of the Site. Please review, and either rectify the discrepancy or provide clarification, whichever is appropriate.	Section 5.5.8.2 has been modified to identify the presence of buildings 701 and 679. Section 5.5.8.2 now reads "Building 701 is located approximately 300 feet from the northern border of the site. Building 679 is located approximately 1,380 feet from the eastern border of the site. Both buildings are currently unused."
CA RWQCB	26	Dunnage Disposal Site #2	Page 5-100, Subsection 5.5.13 The proposed recommendation for the Dunnage Disposal Site #2 is no further action for MEC and MC. Based on the limited extent of the site reconnaissance performed and the approximate size of the Dunnage Disposal Site #2, refer to Map 5.5-1, it is Regional Board's position that a more extensive and thorough site reconnaissance is warranted to support the proposed.	Dunnage Disposal Site #2 is not suspected to contain MEC or MC. It is currently identified as IRP Site 34b. Further investigation at this site will be conducted under the IRP.
CA	27	Dunnage	Page 5-110, Table 5.6-1	Terrier and Sidewinder Roads were

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RWQCB		Disposal Site #3	Please provide the years that Terrier and Sidewinder Roads were constructed. This information will assist establishing site boundaries.	constructed in 1945. This information has been added to Table 5.6-1.
CA RWQCB	28	Dunnage Disposal Site #3	Page 5-117, Subsection 5.6.11 Ground Water The discussion of the ground water vapor inhalation exposure route for the biota receptor contradicts the information presented in Figure 5.6-4. The exposure route is described as incomplete in Subsection 5.6.11 and potentially complete in Figure 5.6-4. Please review, and either rectify the discrepancy or provide clarification, whichever is appropriate.	Figure 5.6-4 was modified to reflect the incomplete pathway as described in Section 5.6.11.
CA RWQCB	29	Dunnage Disposal Site #3	Page 5-120, Subsection 5.6.13 Recommendations Regarding the proposed ground water monitoring network, it is the Regional Board's position that currently there is a insufficient data available at the site to propose a network that is in compliance with Applicable or Relevant and Appropriate Requirements (ARARs). Typically these networks are designed and installed during Remedial Investigation (RI) phase based on site-specific data.	Dunnage Disposal Site #3 could potentially contain MEC or MC. It is currently identified as IRP Site 34c. An SI under the MMRP is being recommended to further investigate the possibility of MEC and/or MC at the site.
CA	30	Dunnage	Page 5-134, Subsection 5.7.13	Dunnage Disposal Site #5 is not

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RWQCB		Disposal Site #4	Recommendations The proposed recommendation for the Dunnage Disposal Site #4 is no further action for MEC and MC. Based on the limited extent of the site reconnaissance performed and the approximate size of the Dunnage Disposal Site #4, refer to Map 5.7-1, it is the Regional Board's position that additional site reconnaissance activities is warranted in the southern portion of the site to support the proposed recommendation.	suspected to contain MEC or MC. It is currently identified as IRP Site 34d. Further investigation at this site will be conducted under the IRP.
CA RWQCB	31	Fallbrook Skeet/Trap Range	Page 5-165, Subsection 5.9.11 Ground Water The discussion on the ground water vapor inhalation exposure route seems to contradict the information presented in Figure 5.9-4. The exposure route is described as incomplete in Subsection 5.9.11 and potentially complete in Figure 5.9-4. Please review, and either rectify the discrepancy or provide clarification, whichever is appropriate.	Figure 5.9-4 was modified to reflect the incomplete pathway as described in Section 5.9.11.
DTSC	32		Upon review, DTSC found that the subject PA is well organized and provided adequate information to support the recommendations: Site Inspection (SI) for Munitions Constituents (MC) at the SF Small Arms Range and the Fallbrook	Comment noted. No response is required.

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			<p>Skeet/Trap Range; SI for both Munitions and Explosives of Concern (MEC) and MC at the QE Test Area, the Salvage Yard Landfill, and the Dunnage Disposal Sites #1 and #3; No Further Action (NFA) at Dunnage Sites #2, #4, and #5. Navy informed DTSC during the November 29, 2005 Site visit, that the proposed "no further action" recommendations for Dunnage Sites #2, #4, and #5 are for the Munitions Response Program. Site Inspections will be conducted at these sites under the Installation Restoration (IR) Program as funding is available.</p> <p>DTSC concurs with the PA recommendations. However, if additional data becomes available, the recommendations will be re-evaluated accordingly.</p>	

Naval Weapons Station Seal Beach, Detachment Fallbrook
 Draft Final Preliminary Assessment for the Munitions Response Program Depot Lake and Lower Lake, February 2006
 Comments (received from DTSC and CA RWQCB) and Responses (Malcolm Pirnie)
 May 2006

Document: Draft Final Preliminary Assessment for the Munitions Response Program, Depot Lake and Lower Lake - Naval Weapons Station Seal Beach, Detachment Fallbrook

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CA RWQCB	1	Subsection 3.6 Hydrology	The current description of the hydrology at the Sites includes the number and location of tributaries to the Sites, and the location of surface water discharge points for the Sites, dam and spillway. The Subsection should be expanded to identify all downgradient receiving surface water body(s) for the Sites.	<p>Concur. Downgradient receiving surface water bodies for the sites have been identified and included.</p> <p>Parts of Section 3.6 now read:</p> <ul style="list-style-type: none"> For Depot Lake: "Water is released from the lake by a spillway running beneath Terriea Road to the south. The spillway releases the lake water into an intermittent stream that connects with the Santa Margarita River outside the installation boundaries." For Lower Lake: "The dam releases the lake water into an intermittent stream that feeds Lake O'Neill on MCB Pendleton."
CA RWQCB	2	Subsections 5.1.1 and 5.2.1 History and	The uses of the Sites identified in these Subsections include water storage for stock water and fire protection, fish and wildlife	As discussed in Sections 5.1.11 and 5.2.11, inhalation and dermal contact of surface water is considered a potentially

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		Site Description	enhancement, and recreational boating and fishing. Please expand the discussion to indicate whether or not humans use the Sites for activities involving body contact and ingestion of water. This information can be used in the future to develop a comprehensive risk assessment for the Sites.	complete pathway. As of 2004, recreational boating and fishing were discontinued at Depot and Lower Lakes. No swimming is allowed at the lakes. At this time, all recreational activities, including fishing and swimming, at the lakes have been suspended until further investigation by IRP and MRP.
CA RWQCB	3	Subsections 5.1.7 and 5.2.7 Contaminant Migration Routes	The PA includes the following contaminant migration routes: sediment transport and deposition; construction, excavation, and maintenance activities; off Base surface water flow; and surface water infiltration to ground water. Since the Sites are used to store water for wildfire suppression activities, it seems the Subsections need to be augmented to include these activities. Note that Table 5.1-1 (Munitions/Release Profile, Migration Routes/Release Mechanisms) requires revision to address this issue and to include surface water infiltration to ground water.	Concur, the use of lake water for wildfire suppression will be added as a migration route. Subsections 5.1.7 and 5.2.7 now include the following text: "Potentially contaminated lake water could also migrate during its use for fire suppression. Lake water contaminated with MC might infiltrate into the groundwater." Tables 5.1-1 and 5.1-2 also reflect this change.
CA RWQCB	4	Subsections 5.1.8 and 5.2.8 Receptors and Pathways	The PA includes the following receptors: human at the Sites, humans downgradient of the Sites and off Base that come into contact with site related MC discharging through the surface water system, and ecological receptors that come into contact	Benthic aquatic life was considered as part of the ecological receptors. Civilian and military personnel were considered as part of the human receptors off-base receiving surface water. The discussions of receptors will be clarified to show

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			<p>with contaminated surface water or ingest MC incorporated into the food chain. Additional receptors that need to be discussed are benthic aquatic life at the Sites and in downgradient receiving surface waters, and civilians and military personnel at Marine Corps Base Camp Pendleton using surface and ground waters for municipal and domestic purposes.</p>	<p>inclusion of the receptors identified in the comment. Subsections 5.1.8 and 5.2.8 now read: "Human receptors ... include Navy personnel and Navy-permitted visitors (including contractors). Ecological receptors (including benthic aquatic life) may come into direct contact with MC in the sediment and/or water. Ecological receptors may also come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and prey). The general public (including MCB Camp Pendleton military personnel and civilians) could also come into contact with MC flowing out of the lake and off of the installation through the surface water system."</p>
CA RWQCB	5	Tables 5.1-1 and 5.2-1 Ecological Profile, Degree of Disturbance	<p>According to Tables 5.1-1 and 5.2-1, the disturbance at each of the Sites is expected to be low and the disturbance below the water level is expected to be minimal. Whereas these expectations may be correct the majority of the time, they are most probably incorrect during the removal of surface waters for wildfire suppression. Either revise the finding, or provide in the</p>	<p>The fire department (Station 9) uses a helicopter and bucket method to remove water from Depot Lake and Lower Lake. The bucket holds 300 gallons of water and only goes down 4 feet into the water. This action is performed on average twice a year during fire season. From this description, it would not appear that the bucket method would significantly</p>

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			response to comments (RTC) an explanation as to why the Sites will not be significantly disturbed during these activities.	disturb the sediments in the lakes.
CA RWQCB	6	Pages 5-13, 5-32, and 5-33 MEC and MC Interactions and Pathway Analysis	Since surface water from the Sites are used for wildfire suppression, it seems the discussions should include the possibility of MEC and MC (sediment and surface water exposure media) removal and offsite disposal during these activities. PA Figures 5.1-2 and 5.2-2 need to be augmented to include the use of surface water from the Sites for wildfire suppression.	Water usage to fight wildfires is not considered a disposal activity. The figures have been updated to include wildfire suppression activities. The MEC Interactions Pathway Analysis would not be affected because the technique used to remove water from the lakes is not expected to disturb the sediments, which is where any MEC in the lakes would be encountered. The MC Interactions and Pathway Analysis for both lakes now includes the following text: "Water removed during wildfire suppression actions could potentially transfer MCs in the surface water from the lake onto the wildfire area."
CA RWQCB	7	Pages 5-13, 5-14, and 5-33 MC Interactions and Pathway Analysis, Surface and Ground	The discussion should be expanded to include the fact that civilians and military personnel at Marine Corps Base Camp Pendleton use surface and ground waters from the Santa Margarita Hydrologic Unit for municipal and domestic purposes.	Concur; the discussion will be expanded to include uses of water downstream. <ul style="list-style-type: none"> • The MC Interactions and Pathway Analysis for Surface Waters for Depot and Lower Lake now includes the following text: "As mentioned in Section 3.7, MCB Camp Pendleton uses surface water from the Santa

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		Waters		<p>Margarita River Watershed for municipal and domestic purposes. This could potentially affect both civilians and military personnel at MCB Camp Pendleton."</p> <ul style="list-style-type: none"> • The MC Interactions and Pathway Analysis for Groundwaters for Depot and Lower Lake now includes the following text: "As mentioned in Section 3.7, MCB Camp Pendleton extracts and uses groundwater from the Santa Margarita Watershed; this could potentially affect both civilians and military personnel at MCB Camp Pendleton."
CA RWQCB	8	Subsections 5.2.1 and 5.2.1.4, Table 5.2-1, and Map 5.2-2	<p>The descriptions of the Site presented in the above noted Subsections and Table differs significantly from that illustrated Map 5.2-2. As an example, the Site description in Subsection 5.2.1 identifies the location of the Lower Lake dam to be at the southern end of the Lake. Yet Map 5.2-2 illustrates the dam as being located at the western end of the Lower Lake.</p>	<p>Concur; the description of the Lower Lake dam will be corrected to say that the dam is located on the western end.</p>
CA RWQCB	9	Page IV	Include a definition of "magazine"	Concur. Definition added.
CA	10	Page 5-4,	Typographical error – "...7.2-inch-inch	Concur. Text corrected.

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RWQCB		Subsection 5.1.3, 2 nd Paragraph	projector charges....”	
CA RWQCB	11	Appendix A References	Include the USACE, 2003 and EPA/540/G-89/004 references noted on Page 5-7.	Concur. References added to Appendix A.
CA RWQCB	12	Tables 5.1-1 and 5.2-1, and Subsections 5.1.6 and 5.2.6 Associated Munitions Constituents Columns, 1 st Bullets	Typographical error “...lead chromate(VI)....”	Concur. Text corrected.
CA RWQCB	13	Tables 5.1-1 and 5.2-1 Associated Munitions Constituents Columns, 2nd Bullets	Based on the information presented in Appendix D regarding the 7.2-inch projector charges, it seems “Torpex” should be included.	Torpex is composed of the MC reported in the tables: 42% RDX, 40% TNT, and 18% aluminum.
CA RWQCB	14	Table 5.2-1 Associated Munitions Constituents Column, 1 st	Typographical error “...cumene hydroperoxide, , methyl....”	Concur. Text corrected.

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CA RWQCB	15	Bullet Page 5-22, 2 nd Paragraph, 1 st Sentence	"...south and east and costal sage...."	Concur. Text corrected.
DTSC	16	Characteristics of the Lakes	There is no mention of the depth of the two lakes. Please include this information in the final PA.	Concur. Approximate depths have been added to the description of the two lakes. Section 5.10.1.1 now reads: "The lake is approximately 4 to 10 feet deep in the summer months and 6 to 18 feet deep in the winter months." and Section 5.11.1.1 now reads: "The lake is approximately 8 to 16 feet deep during the summer months and 12 to 25 feet during the winter months."

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